THE IMPACT OF TRUMBULL AIRPORT

PREPARED BY THE STAFFS OF THE SOUTHEASTERN CONNECTICUT REGIONAL PLANNING AGENCY
AND THE TOWN OF GROTON PLANNING OFFICE • SEPTEMBER, 1972

THE IMPACT OF TRUMBULL AIRPORT

Projects CPA-CT-01-26-1004
and CPA-CT-01-26-1018

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Prepared by the Staffs of the
Southeastern Connecticut Regional Planning Agency
139 Boswell Avenue, Norwich, Connecticut
and the
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Groton Town Hall, Groton, Connecticut

September, 1972

ABSTRACT OF REPORT

1. Title: *The Impact of Trumbull Airport.*

2. Author: Staffs of the Southeastern Connecticut Regional Planning Agency, 139 Boswell Avenue, Norwich, Connecticut, 06360, and the Town of Groton Planning Office, Groton Town Hall, Groton, Connecticut, 06340.

3. Subject: Economic and environmental impact of a small commercial airport.

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9. Abstract: The report describes the physical and operational characteristics of Trumbull Airport in Groton, Connecticut. It also describes the natural and human environmental values around the Airport. The study reviews both existing and possible future alternative modes of transportation to serve the Southeastern Connecticut Region. It evaluates both the economic and environmental impact of the Airport at its present level of operation. Previous forecasts by the Connecticut Department of Transportation of traffic volumes at Trumbull Airport are found to be highly optimistic and not validly related to the Region's probable population and economic growth. Four alternative models of possible airport operational characteristics in 1990 are analyzed for their noise impact through Noise Exposure Forecasts. The report presents a series of recommendations to minimize future adverse effects from Trumbull Airport's operation.

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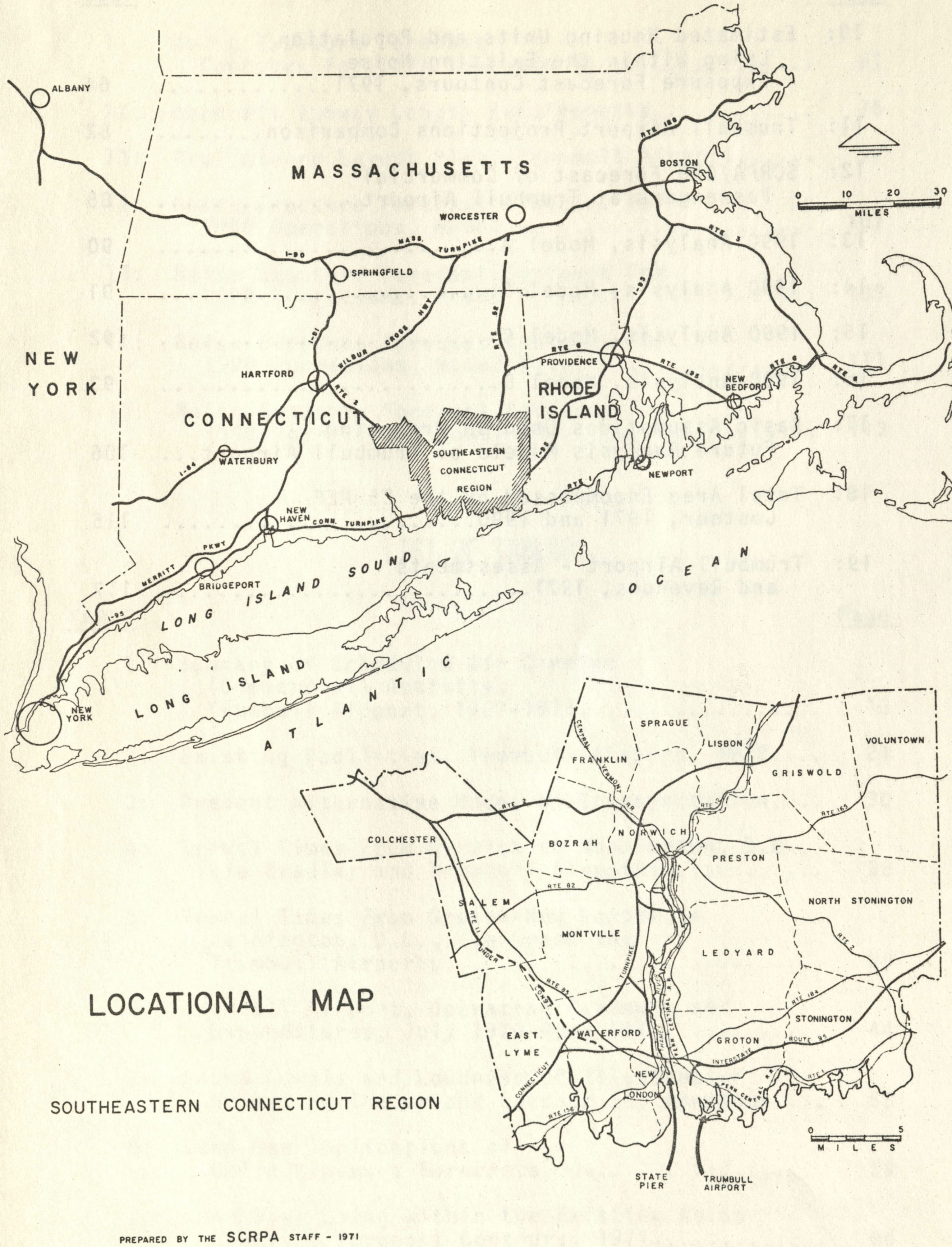


LOCATIONAL MAP

SOUTHEASTERN CONNECTICUT REGION

PREPARED BY THE SCRPA STAFF - 1971

I. INTRODUCTION

In July, 1971, the Connecticut Department of Transportation submitted to SCRPA a proposed long-range capital improvements program for Trumbull Airport prepared as part of the National Transportation Needs Study. Among other improvements, the program proposed substantial expansion of terminal facilities and an extension of the main runway at Trumbull. In response to the extensive development proposed by the State, the Town of Groton Planning Commission in September requested SCRPA to cooperate with them in a study of the economic and environmental impact of Trumbull Airport on the Town and the Region and an evaluation of the Airport improvement plan proposed by the State. SCRPA agreed to the joint study, and this report is the result.

Two points must be emphasized regarding the study. First, it is not intended to be a comprehensive plan for the future development of Trumbull Airport. The report's function is to review available data on the Airport and to evaluate the effects of both present and potential future operations. Hopefully, the report will provide a basis for responsible local officials to judge the type of operations that can be conducted at Trumbull without major disruption to the Town. Second, the impact analysis presented in the report is not intended to have the detail nor to serve the function of an environmental impact statement under the terms of Section 102 of the National Environmental Policy Act of 1969.

A first draft of this study was reviewed by a special committee representing several agencies concerned with the future of Trumbull Airport. Active participants on the committee were: David Wordell, SCRPA Chairman; Fred Burnham, Town of Groton Planning Commission Chairman; Charles R. Mann, representing the Groton Town Council; E. Zell Steever, Town of Groton Conservation Commission Chairman; S. Joseph Wornom, Jr., representing the Groton City Council; Longene Chmura of the City of Groton Conservation Commission; Joseph Fugere, representing the Chamber of Commerce of Southeastern Connecticut; Sanford Meech, representing the Regional Organization for Airport Restudy; and Roy Perkins, representing the Connecticut Department of Transportation. The comments, questions, and suggestions generated by this group were extremely useful. Participation on the review committee does not imply that all members agree with all conclusions or recommendations presented in this report.

The City of Groton Planning Commission, the Town of Groton Industrial and Development Commission, the Airport Manager, and the Connecticut Department of Environmental Protection were also invited to participate on the review committee. However, they did not have a representative at any of the committee's meetings.

The study was conducted under severe financial constraints, and it could not have been completed without the willing cooperation of several individuals and agencies who contributed data, advice, staff time, equipment, and computer services to this project. We wish to thank in particular: Peter McCabe, former

Executive Director of the Hearing and Speech Center of Southeastern Connecticut; Richard Carson and A. Michael Schindler of the U.S. Navy Underwater Systems Center, New London; John Raissi, Trumbull Airport Manager; Roy Perkins and George Sherwood, Connecticut Department of Transportation; George Cordes, Customer Service Manager, Allegheny Airlines; and John Rutledge, Chief Pilot, Pilgrim Airlines. The assistance provided by these individuals and agencies should not be interpreted as endorsement of the conclusions and recommendations reached in this study.

Primary responsibility for the preparation of sections of the report was as follows:

II. Trumbull Airport Today - SCRPA and GPO staffs.

III. Present Alternative Modes of Transportation - SCRPA staff.

IV. Current Impact of Trumbull Airport.

- A. Impact on Secondary Facilities - GPO staff.
- B. Economic Impact - GPO staff.
- C. Natural and Human Environmental Impact - SCRPA staff.

V. Future Considerations.

- A. Future Market Potential - GPO staff.
- B. Transportation Functions - GPO staff.
- C. Future Alternative Modes of Transportation - SCRPA staff.
- D. Evaluation of Previous Forecasts for Trumbull Airport - SCRPA staff.

VI. Evaluation of Future State Plan for Trumbull Airport.

- A. Future State Airport Plan - SCRPA staff.
- B. Evaluation of Environmental Impact - SCRPA staff.
- C. Impact of Industrial Development at the Airport - GPO staff.
- D. Secondary Impact on Ancillary Facilities and Services - GPO staff.

VII. Conclusions and Recommendations - SCRPA and Groton Planning Commission.

DEFINITIONS OF TERMS

AIR CARRIER AIRPORT - An airport used regularly by scheduled air carriers.

AIRCRAFT MOVEMENT - An aircraft take-off from or landing at an airport.

CERTIFICATED AIR CARRIER - An air carrier which holds a certificate of public convenience and necessity or or foreign air carrier permit issued by the Civil Aeronautics Board, or is a foreign air carrier holding a certificate or equivalent issued by its sovereign government.

CHARTER AIR TAXI - An aircraft operator who offers flight service on a non-scheduled basis and operates within Federal Aviation Regulation Part 135 and the 12,500-pound weight restriction.

COMMERCIAL AIRCRAFT - Aircraft of certificated and commuter air carriers.

COMMERCIAL PASSENGERS - Persons utilizing air transportation of certificated and commuter air carriers.

COMMUTER AIR CARRIER OR AIR TAXI - An air carrier which operates pursuant to a Registration for Exemption under Part 298 of the Economic Regulations of the Civil Aeronautics Board and which performs scheduled flight service in accordance with such Part 298 but which does not hold a certificate of public convenience and necessity or foreign air carrier permit issued by the Civil Aeronautics Board.

DEPLANEMENT - One passenger getting off an aircraft.

ENPLANEMENT - One passenger boarding an aircraft.

GENERAL AVIATION AIRPORT - An airport used by aircraft other than those of scheduled air carriers.

LOCAL SERVICE CARRIER - Certificated domestic route air carriers operating routes of less density between the smaller traffic centers and between those centers and principal centers.

MARKET AREA - The geographic area from which scheduled air carriers obtain their passengers for departure from an air carrier airport.

SCHEDULED AIR CARRIER - A combination of certificated and commuter air carriers.

SERVICE AREA - The geographic area to which scheduled air carriers fly from an air carrier airport.

SHORT-HAUL SERVICE - Service up to 500 miles by scheduled air carriers from an air carrier airport.

THIRD LEVEL CARRIER - A term used interchangeably with "scheduled air taxi" to denote an airline which operates within Federal Aviation Regulation Part 135. The aircraft are operated on a fixed schedule and route; however, the Civil Aeronautics Board does not protect the routes from competition of others. Each third level carrier is certificated and inspected by the Federal Aviation Administration. Aircraft operating within this designation are limited to a maximum gross weight of 12,500 lbs. Additionally, third level carrier operations pursuant to a Registration for Exemption under Part 298 of the Economic Regulations of the Civil Aeronautics Board.

TRUNK CARRIER - Certificated domestic route air carriers operating primarily within the geographical limits of the 48 contiguous States of the United States and the District of Columbia over routes serving primarily the larger communities.

II. TRUMBULL AIRPORT TODAY

A BRIEF HISTORY OF TRUMBULL AIRPORT

In 1929, the State of Connecticut at a cost of approximately $124,000 acquired a 246-acre tract from the estate of Morgan Plant which constituted the nucleus of Trumbull Airport. At the time, the property contained numerous farm buildings, such as a mill, creamery, cow barn, horse barn, hay barn, etc. With the coming of the Depression, part of the property became a WPA camp for unemployed, and the State, with the cooperation of the WPA and the assistance of some Civil Aviation Administration funds, endeavored to convert the farm acreage into an air field.

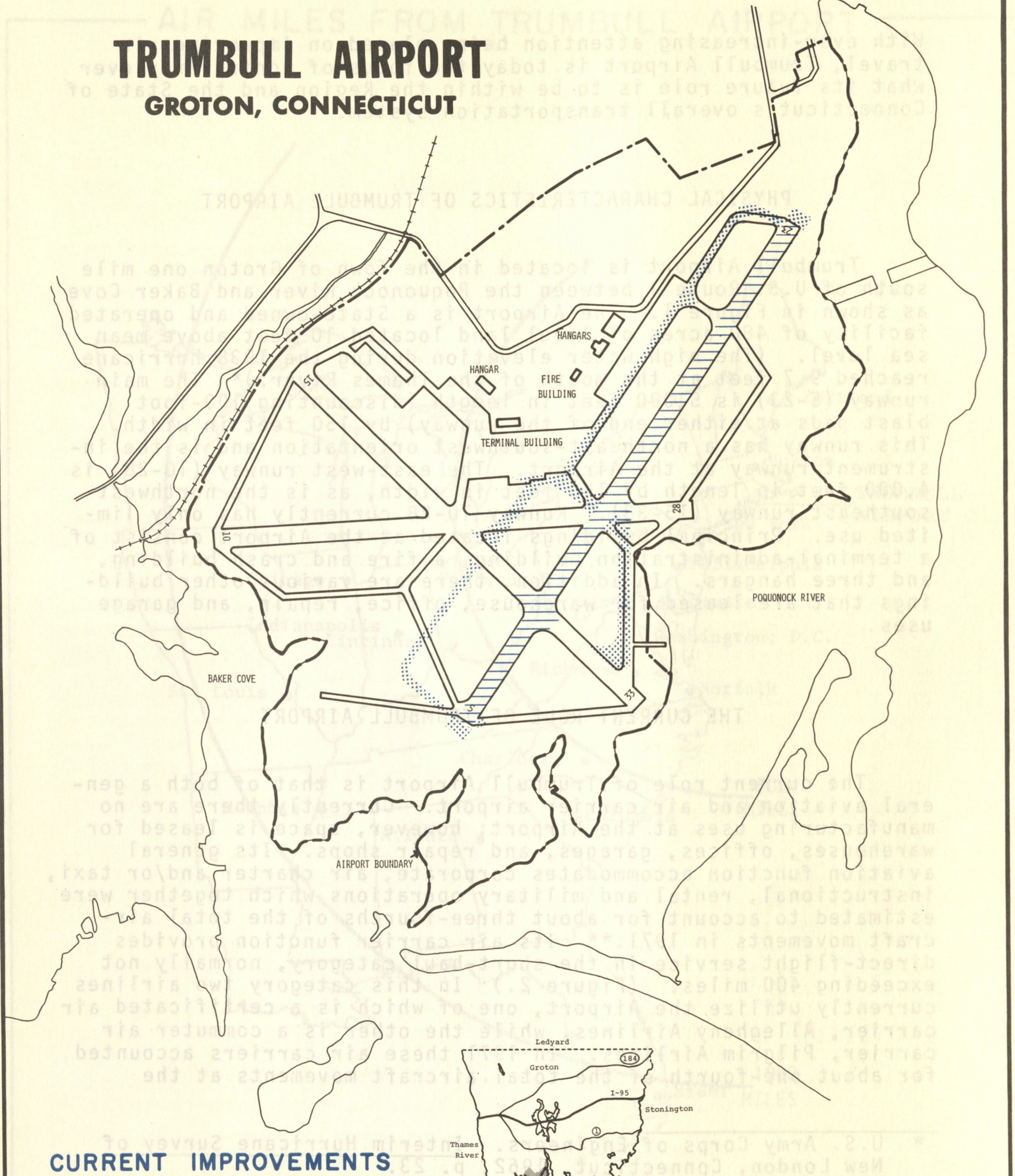
However, it was not until 1941, when the field was leased to the U.S. Army, that a substantial development took place. The Army and the Civil Aviation Administration undertook the construction of the three concrete runways, taxiways, and aprons. In 1942, the Airport was transferred to the Navy which utilized it as a satellite field to the Naval Air Station at Quonset Point, Rhode Island, and as an anti-submarine patrol base. The Navy continued jurisdiction over the Airport until July, 1946, when it was released to the War Assets Administration as surplus property and subsequently returned to the State.

During the military's five-year occupancy of the Trumbull facilities, its area was expanded to 465 acres and a railroad spur was extended from the main line of the New York, New Haven, and Hartford Railroad to serve not only the Airport property but also Electric Boat Division properties at the rear of Fort Hill. In total, the Army and Navy spent in excess of $1 million improving the existing buildings to adapt them to the uses required and to construct approximately 90 temporary buildings. Of particular note is the fact that the Navy had begun to install a system of runway lights, work on which was interrupted on V.J. Day, and the equipment was removed.

Between 1946 and 1961, the State made no major improvements at Trumbull Airport. During the 1953-60 period, Northeast Airlines provided limited service from the Airport. In 1961, money was appropriated by the State for a new terminal, and the lighting was updated. Funds from the Federal Aviation Administration (FAA) provided new safety and control equipment, and the new facilities were ready by 1963. Allegheny Airlines leased quarters at Trumbull in 1960 to serve the Washington-Providence route, and in 1962, Pilgrim Airlines began operation of daily air taxi service to Kennedy (then Idlewilde) Airport. In 1961, the Army's 162nd Transportation Battalion located at Trumbull. Currently this group repairs and rebuilds Army helicopters and trains the National Guard.

Today, Trumbull Airport encompasses 480 acres, has a 9,699-square foot terminal building, 47,000 square feet of hangar storage and airport facilities space, parking facilities for nearly 300 cars, and a new crash equipment building completed in 1970.

TRUMBULL AIRPORT
GROTON, CONNECTICUT



CURRENT IMPROVEMENTS

RUNWAY REPAVING

NEW CONSTRUCTION

FIGURE I

With ever-increasing attention being placed on improving air travel, Trumbull Airport is today the focus of controversy over what its future role is to be within the Region and the State of Connecticut's overall transportation system.

PHYSICAL CHARACTERISTICS OF TRUMBULL AIRPORT

Trumbull Airport is located in the Town of Groton one mile south of U.S. Route 1 between the Poquonock River and Baker Cove as shown in Figure 1. The Airport is a State-owned and operated facility of 480 acres of level land located 10 feet above mean sea level. (The high water elevation during the 1938 hurricane reached 9.7 feet at the mouth of the Thames River.)* The main runway (5-23) is 5,000 feet in length (discounting 100-foot blast pads at either end of the runway) by 150 feet in width. This runway has a northeast-southwest orientation and is the instrument runway at the Airport. The east-west runway (10-28) is 4,000 feet in length by 150 feet in width, as is the northwest-southeast runway (15-33). Runway 10-28 currently has only limited use. Principal buildings located at the Airport consist of a terminal-administration building, a fire and crash building, and three hangars. In addition, there are various other buildings that are leased for warehouse, office, repair, and garage uses.

THE CURRENT ROLE OF TRUMBULL AIRPORT

The current role of Trumbull Airport is that of both a general aviation and air carrier airport. Currently there are no manufacturing uses at the Airport; however, space is leased for warehouses, offices, garages, and repair shops. Its general aviation function accommodates corporate, air charter and/or taxi, instructional, rental and military operations which together were estimated to account for about three-fourths of the total aircraft movements in 1971.** Its air carrier function provides direct-flight service in the short-haul category, normally not exceeding 400 miles. (Figure 2.) In this category two airlines currently utilize the Airport, one of which is a certificated air carrier, Allegheny Airlines, while the other is a commuter air carrier, Pilgrim Airlines. In 1971 these air carriers accounted for about one-fourth of the total aircraft movements at the

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* U.S. Army Corps of Engineers. Interim Hurricane Survey of New London, Connecticut, 1962, p. 23.

** State Bureau of Aeronautics. Monthly Statistical Reports of Airport Activities, 1967-71.

AIR MILES FROM TRUMBULL AIRPORT

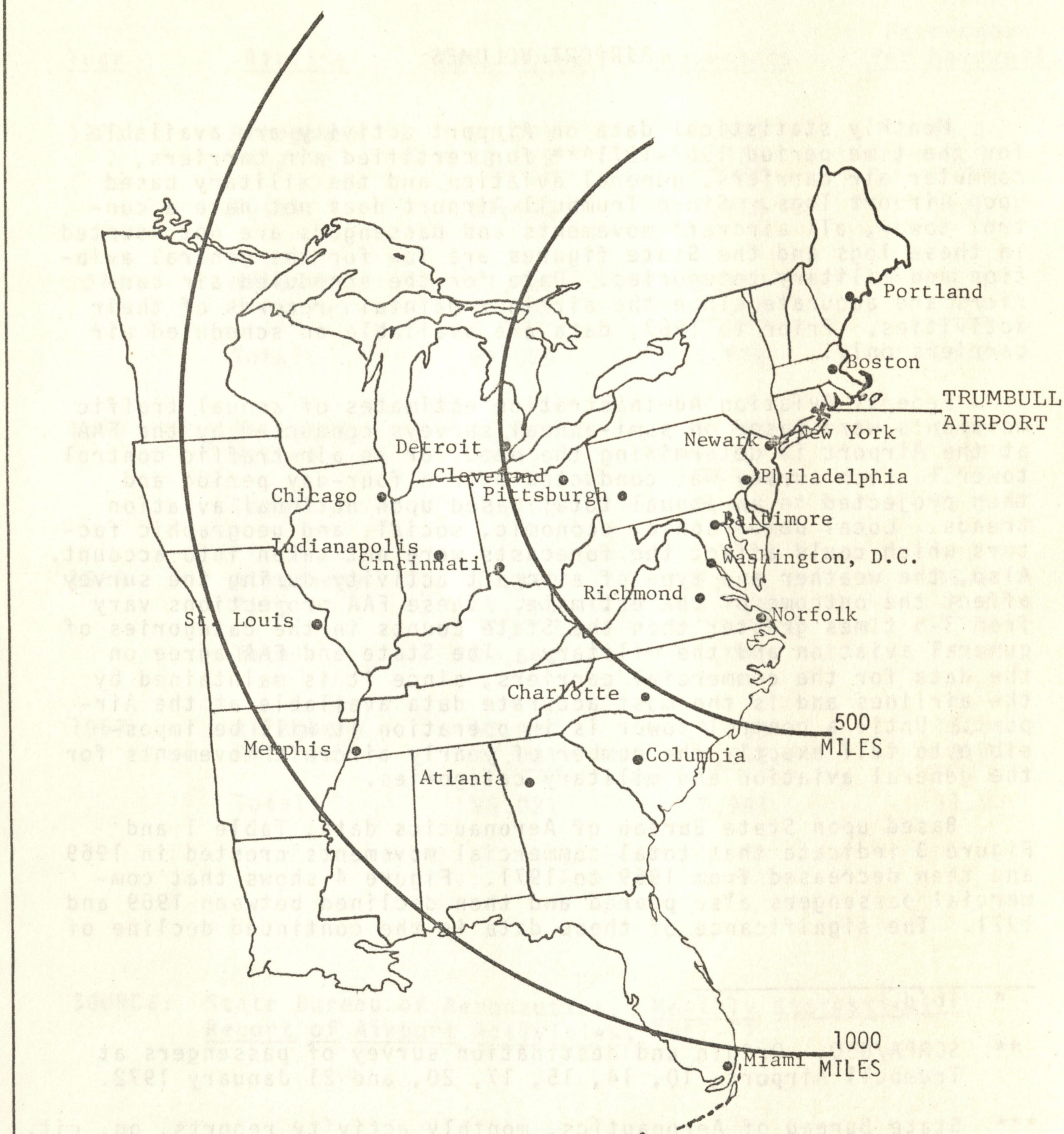

FIGURE 2

Airport.* The existing market area of these two carriers is basically the Southeastern Planning Region, with 94% of the passenger departures originating within the Region.**

AIRPORT VOLUMES

Monthly statistical data on Airport activity are available for the time period 1967-1971*** for certified air carriers, commuter air carriers, general aviation and the military based upon Airport logs. Since Trumbull Airport does not have a control tower, all aircraft movements and passengers are not counted in these logs and the State figures are low for the general aviation and military categories. Data for the scheduled air carriers are accurate since the airlines maintain records of their activities. Prior to 1967, data are available on scheduled air carriers only.

Federal Aviation Administration estimates of annual traffic movements were based on semi-annual surveys conducted by the FAA at the Airport in determining the need for an air traffic control tower.+ Each survey was conducted over a four-day period and then projected to an annual total based upon national aviation trends. Local demographic, economic, social, and geographic factors which could affect the forecasts were not taken into account. Also, the weather and type of aircraft activity during the survey affect the outcome of the estimate. These FAA projections vary from 3-5 times greater than the State counts in the categories of general aviation and the military. The State and FAA agree on the data for the commercial carriers, since it is maintained by the airlines and is the most accurate data available at the Airport. Until a control tower is in operation it will be impossible to tell exactly the number of yearly aircraft movements for the general aviation and military categories.

Based upon State Bureau of Aeronautics data, Table 1 and Figure 3 indicate that total commercial movements crested in 1969 and then decreased from 1969 to 1971. Figure 4 shows that commercial passengers also peaked and then declined between 1969 and 1971. The significance of these data is the continued decline of

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* Ibid.

** SCRPA/GPO. Origin and destination survey of passengers at Trumbull Airport, 10, 14, 15, 17, 20, and 21 January 1972.

*** State Bureau of Aeronautics, monthly activity reports, op. cit.

\+ Letter from Robert A. McEwing, Chief, Planning Branch, New England Region, Federal Aviation Administration, 1 March 1972.

TABLE 1: SUMMARY OF SCHEDULED AIR CARRIER (COMMERCIAL) ACTIVITY, TRUMBULL AIRPORT, 1967-1971

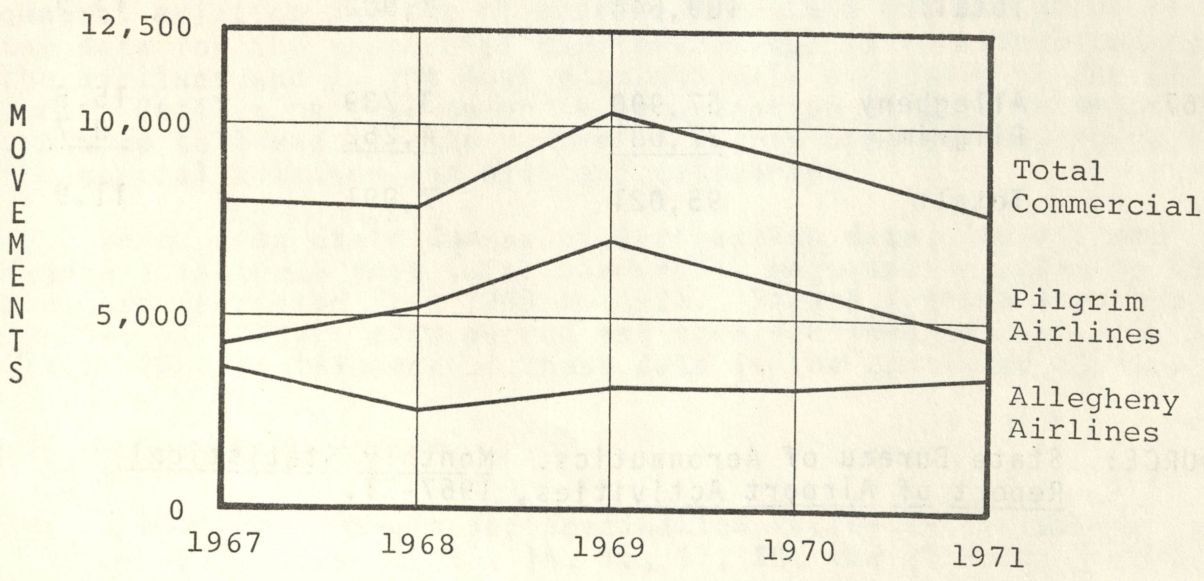
Year	Airline	Passengers	Movements	Passengers Per Movement
1971	Allegheny	50,861	3,596	14.1
	Pilgrim	38,579	4,320	8.9
	Total:	89,440	7,916	11.3
1970	Allegheny	52,325	3,310	15.8
	Pilgrim	41,354	5,862	7.1
	Total:	93,679	9,172	10.2
1969	Allegheny	61,677	3,336	18.5
	Pilgrim	49,425	7,012	7.1
	Total:	111,102	10,348	10.7
1968	Allegheny	67,940	2,678	25.4
	Pilgrim	41,704	5,224	8.0
	Total:	109,644	7,902	13.9
1967	Allegheny	57,990	3,739	15.5
	Pilgrim	37,031	4,252	8.7
	Total:	95,021	7,991	11.9

SOURCE: State Bureau of Aeronautics. Monthly Statistical Report of Airport Activities, 1967-71.

commercial aircraft movements and passengers from 1969 to 1971, with movements down 23.5% and passengers down 19.5%. This experience was typical of many airports across the country during this period of sluggishness in the national economy. Data for January through April 1972 show that commercial movements and passengers at Trumbull are up over the corresponding period for 1971. This may indicate that the downward trend has stopped, although one should see if this new trend continues throughout the year.

Table 1 also indicates the average number of passengers per movement for each year. Pilgrim Airlines ranged from a low of 7.1 passengers (36% of plane capacity) per movement in 1969 and 1970 to a high of 8.9 passengers (45% of plane capacity) per movement in 1971. Allegheny Airlines ranged from a high of 25.4 passengers (51% of plane capacity) per movement in 1968 to a low of 14.1 passengers (28% of plane capacity) per movement in 1971.

COMMERCIAL AIRCRAFT MOVEMENT TRENDS
TRUMBULL AIRPORT, 1967-1971

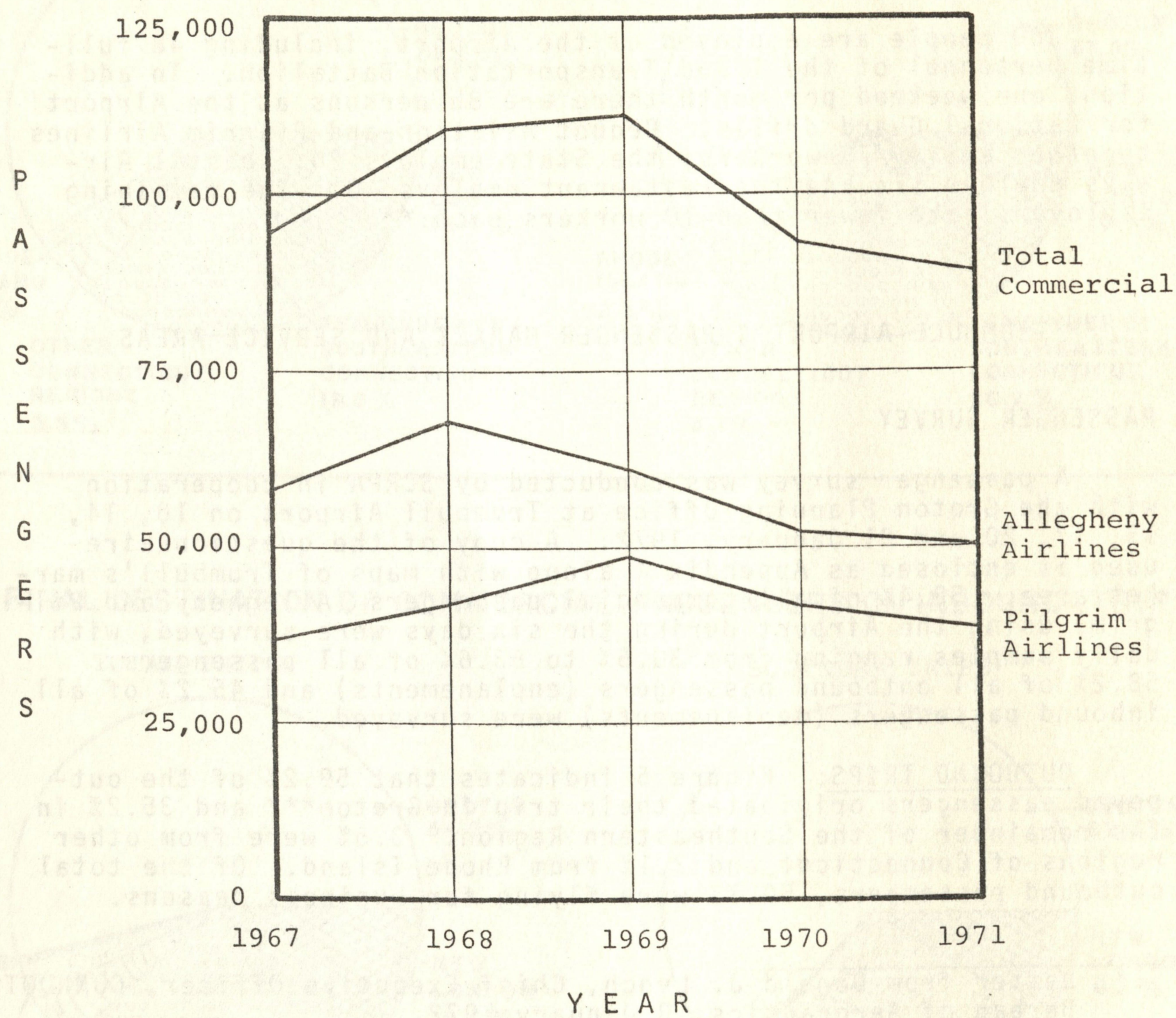


SOURCE: State Bureau of Aeronautics. Monthly Statistical Reports of Airport Activities, 1967-71.

FIGURE 3

COMMERCIAL PASSENGER TRENDS

TRUMBULL AIRPORT, 1967-1971



SOURCE: State Bureau of Aeronautics. Monthly Statistical Reports of Airport Activities, 1967-71.

FIGURE 4

EMPLOYMENT AT TRUMBULL AIRPORT

Currently there are no manufacturing uses at Trumbull Airport. Pfizer, Inc., leases one building for a warehouse; Coastal Airways and Pequot Aviation lease hangars; the 162nd Transportation Battalion leases hangar, office and shop space; Offshore Raydist, Inc., leases office space; and the Hertz Corporation leases a garage. The remainder of the buildings are used by the Bureau of Aeronautics in the operation of the Airport.*

200 people are employed at the Airport, including 48 full-time personnel of the 162nd Transportation Battalion. In addition, one weekend per month there are 85 persons at the Airport for National Guard drills. Pequot Aviation and Pilgrim Airlines together employ 75 workers; the State employs 20; Coastal Airways employs 11; and the restaurant employs 10. The remaining employers have fewer than 10 workers each.**

TRUMBULL AIRPORT'S PASSENGER MARKET AND SERVICE AREAS

PASSENGER SURVEY

A passenger survey was conducted by SCRPA in cooperation with the Groton Planning Office at Trumbull Airport on 10, 14, 15, 17, 20 and 21 January, 1972. A copy of the questionnaire used is enclosed as Appendix 1 along with maps of Trumbull's market area. 52.4% of all commercial passengers (Allegheny and Pilgrim) using the Airport during the six days were surveyed, with daily samples ranging from 30.5% to 63.6% of all passengers. 58.2% of all outbound passengers (enplanements) and 45.2% of all inbound passengers (deplanements) were surveyed.

<u>OUTBOUND TRIPS</u>: Figure 5 indicates that 59.2% of the outbound passengers originated their trip in Groton*** and 35.2% in the remainder of the Southeastern Region. 3.5% were from other regions of Connecticut and 2.1% from Rhode Island. Of the total outbound passengers, 50.7% were flying for business reasons.

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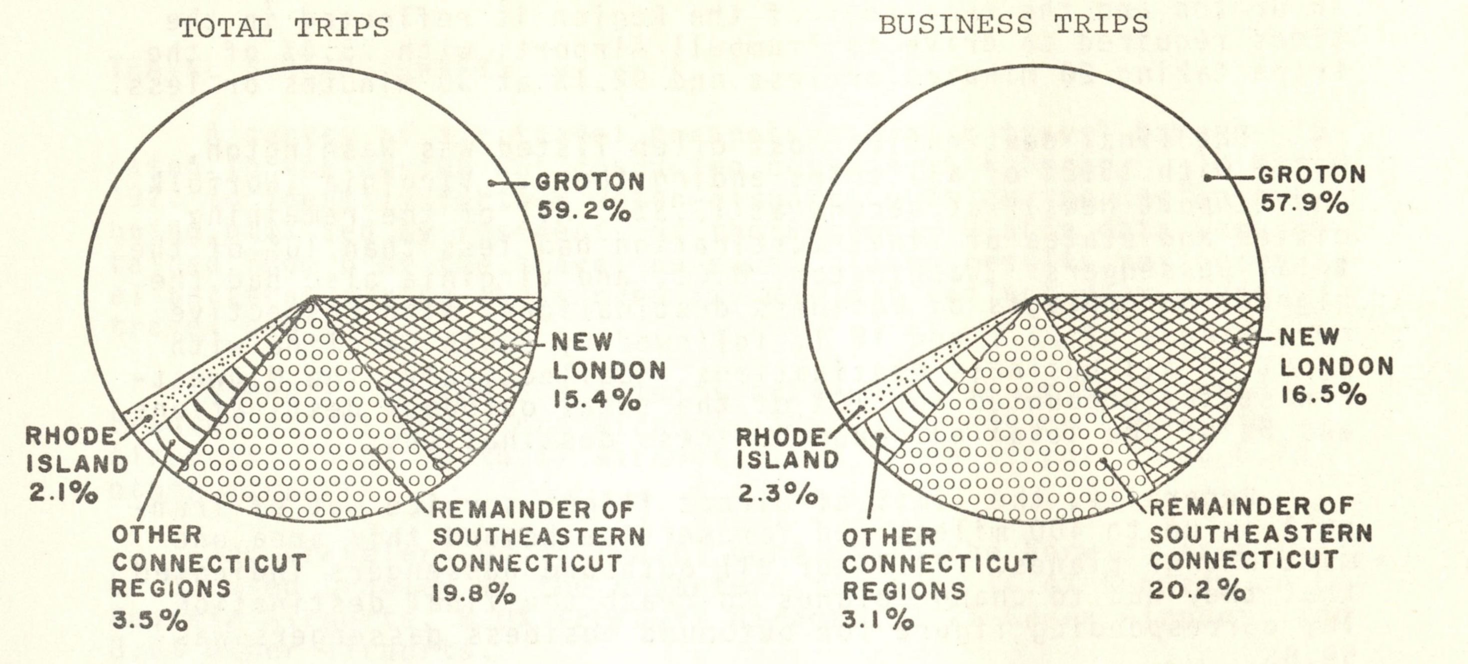
* Letter from Donald J. Lynch, Chief Executive Officer, CONNDOT, Bureau of Aeronautics, 3 January 1972.

** Data provided by John Raissi, Airport Manager, July 1972.

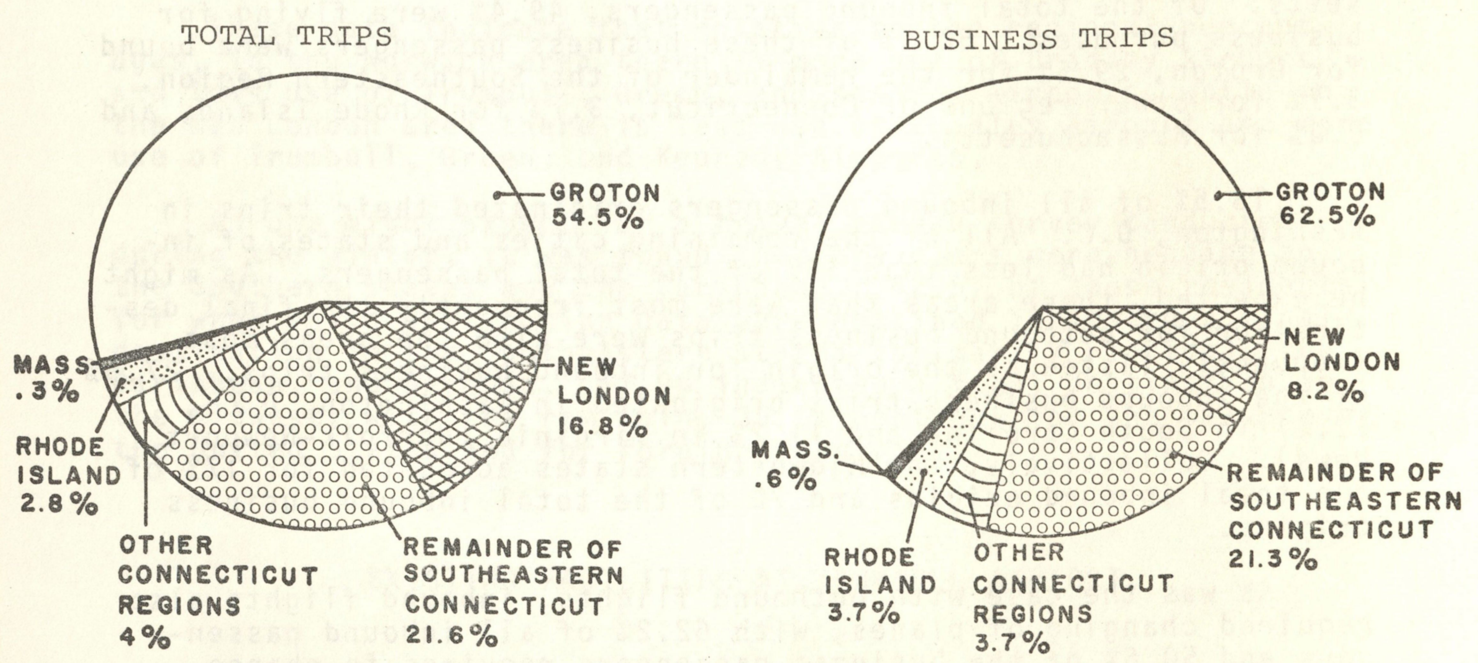
*** <u>Note</u>: "Origin" refers to the starting point of the trip, and this frequently was not the home address of the individual making the trip. As an example, many of the people originating a business trip from a Groton-based firm do not live in Groton.

ORIGIN AND DESTINATION SURVEY TRUMBULL AIRPORT, JANUARY 1972

ORIGIN OF COMMERCIAL PASSENGERS ON OUTBOUND TRIPS



FINAL DESTINATION OF COMMERCIAL PASSENGERS ON INBOUND TRIPS



SOURCE: SCRPA/GPO Origin and Destination Survey at Trumbull Airport; 10, 14, 15, 17, 20, and 21 January, 1972

FIGURE 5

57.9% of these business passengers originated their trip in Groton, 36.7% in the remainder of the Southeastern Region, 3.1% in other Connecticut regions, and 2.3% in Rhode Island.

The high percentage of outbound passengers who originated in Groton and the remainder of the Region is reflected in the times required to drive to Trumbull Airport, with 75.4% of the trips taking 20 minutes or less and 92.1% at 30 minutes or less.

The final destination most often listed was Washington, D.C., with 15.2% of all trips ending there. Virginia (Norfolk and Newport News) was second at 13.3%. All of the remaining cities and states of final destination had less than 10% of the total passengers. Washington, D.C., and Virginia also had the highest percentages of business destinations, with respective percentages of 22.2 and 18.1, followed by South Carolina with 10.9% of all business destinations. Collectively, the Midwestern states accounted for 13% of the total outbound destinations and 5% of the total outbound business destinations.

Generally, the limit of direct flight service out of Trumbull is up to 400 miles, and for service beyond this area one must change planes. 71.7% of all outbound passengers indicated that they had to change planes to reach the final destination. The corresponding figure for outbound business passengers was 59.8%.

INBOUND TRIPS: Figure 5 indicates that 54.5% of the inbound passengers had final destinations in Groton and 38.4% in the rest of the Southeastern Region. 4% were destined to other Connecticut regions, 2.8% to Rhode Island, and 0.3% to Massachusetts. Of the total inbound passengers, 49.4% were flying for business purposes. 62.5% of these business passengers were bound for Groton, 29.5% for the remainder of the Southeastern Region, 3.7% for other regions of Connecticut, 3.7% for Rhode Island, and 0.6% for Massachusetts.

18.5% of all inbound passengers originated their trips in Washington, D.C. All of the remaining cities and states of inbound origin had less than 10% of the total passengers. As might be expected, those areas that were most frequently the final destination for outbound business trips were also the areas most frequently listed as the origin for inbound business trips. 27.5% of the inbound business trips originated in Washington, D.C., 12.5% in South Carolina and 11.2% in Virginia (Norfolk-Newport News). Collectively, the Midwestern states accounted for 17% of the total inbound origins and 7% of the total inbound business origins.

As was the case with outbound flights, inbound flights also required changing of planes, with 62.2% of all inbound passengers and 50.6% of the business passengers required to change planes during their trips.

The major conclusion which emerges from the passenger survey is that the market area of Trumbull Airport is basically Southeastern Connecticut. 94.4% of all outbound trips originated in Southeastern Connecticut and 92.9% of inbound trips had final destinations in Southeastern Connecticut.

TRAVEL BUREAU SURVEY

A survey of air travel arrangements at 9 travel bureaus located in the Region was conducted between 28 February - 10 March 1972 to identify further which airports outside the Region are being utilized by residents of the Region. Usable data were obtained from 6 of the travel bureaus. These results reflect travel patterns during the survey and may not reflect year-round travel habits.

Overall, of the 579 clients surveyed, 298 or 51.5% used Bradley as the departure airport, 18.8% Kennedy or LaGuardia Airports, 15.6% Trumbull Airport, 7.4% Green Airport, and 6.7% other airports.

For travelers using travel bureaus in the Norwich area (187), 66.3% used Bradley as the departure airport, 14.4% Kennedy or LaGuardia Airports, 8.0% Trumbull Airport, 2.7% Green Airport, and 8.6% other airports.

For residents utilizing travel bureaus in the New London-Groton area (392), 44.4% used Bradley as the departure airport, 20.9% Kennedy or LaGuardia Airports, 19.1% Trumbull Airport, 9.7% Green Airport, and 5.9% other airports.

These data indicate that relative to the regional percentages, in the Norwich area there is more use of Bradley Airport and less use of Trumbull, Green, and Kennedy Airports, while in the New London area there is less use of Bradley Airport and more use of Trumbull, Green, and Kennedy Airports.

As one might expect for a travel bureau survey conducted during the winter, it was found that travelers were heading to the Southern states and the Caribbean. 42.5% of those residents for whom valid destination data were obtained indicated a final destination in the Southeastern states (primarily Florida), the Caribbean, and Bermuda. 17.9% indicated a final destination in the Midwest, with the remaining 39.6% destined for the balance of the United States and for foreign countries.

EXISTING FACILITIES AT TRUMBULL AIRPORT

This section of the report will evaluate existing facilities

in terms of their capacity and adequacy. The discussions of terminal passenger space and terminal cargo space are basically an analysis of the needs as seen by the Connecticut DOT.* A summary of terminal passenger, cargo, and parking facilities is shown in Table 2 and a floor plan of the terminal building in Figure 6.

AIRPORT CAPACITY

CONNDOT calculates that the current capacity of Trumbull Airport is 270,000 aircraft movements per year.** CONNDOT's estimate of 42,678 aircraft movements in 1971 indicates that the Airport is operating at 16% of its capacity.

Runway 5-23, the instrument runway at Trumbull, was constructed of concrete by the military in 1941. During the summer of 1972 it was overlain with 6 inches of bituminous concrete. This increased its load-bearing capacity to 113,000 pounds. The runway can now meet the load-bearing requirements of the following aircraft: the BAC-111 (76,000 pounds), the DC-9-31 (100,000 pounds), and the Lockheed Electra (113,000 pounds).*** In addition, 100-foot blast pads of two-inch bituminous concrete were constructed at either end of runway 5-23. These pads are intended to control erosion at the end of the runway caused by engine exhaust streams.

TERMINAL REQUIREMENTS - PASSENGERS

Terminal passenger space is a function of typical peak hour passengers (TPHP) which in turn is a percentage of total annual passengers. The Federal Aviation Administration (FAA) has developed percentages for determining TPHP for medium and large hubs as listed below. A medium hub is a metropolitan area which generated more than 0.25% and less than 0.99% of the nation's scheduled air carrier domestic enplaned passengers during the 12 months ending June 30, 1967. A large hub is one that generated 1% or greater of total enplaned passengers.+ Based upon these standards

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* CONNDOT. Attachment to CONNDOT Airport Plan: Analysis of Facilities, Trumbull Airport, 1971.

** CONNDOT. Attachment to CONNDOT Airport Plan: Trumbull Airport Operations, 1971, p. 6.

*** Conversation with John Raissi, Airport Manager, 26 July 1972.

\+ Federal Aviation Administration. Attachment to: Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980, 1969, p. 1.
Federal Aviation Administration. Attachment to: Aviation Demand and Airport Facility Requirement Forecasts for Large Air Transportation Hubs Through 1980, 1967, p. 1.

TABLE 2: EXISTING FACILITIES, TRUMBULL AIRPORT, 1972

FACILITY	PRESENT CAPACITY	PRESENT CONDITION	ADEQUACY
Runways	270,000 aircraft movements/year.	Runway 5-23 resurfaced in 1972.	CONNDOT estimates there were about 43,000 aircraft movements in 1971. This is 16% of capacity.
	Load-bearing capacity of 113,000 pounds.	Runway 5-23 resurfaced in 1972.	Adequate for several commercial jet aircraft.
Terminal Passenger Space	72 typical peak hour passengers.	Terminal constructed in 1964.	50% of the 144 typical peak hour passenger demand.
Terminal Cargo Space	3.06 tons per day.	Cargo handled in terminal building.	Present volume of 1.76 tons per day.
Terminal Parking Space	244 spaces.	Lot constructed in 1970.	216 spaces needed based on 144 typical peak hour passenger demand.

SOURCES: CONNDOT. Attachments to CONNDOT Airport Plan: Analysis of Facilities, Trumbull Airport and Trumbull Airport Operations, 1971.

Federal Aviation Administration. Aviation Demand and Airport Facility Requirement Forecasts for Large Air Transportation Hubs Through 1980, 1967.

Federal Aviation Administration. Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980, 1969.

TRUMBULL AIRPORT TERMINAL

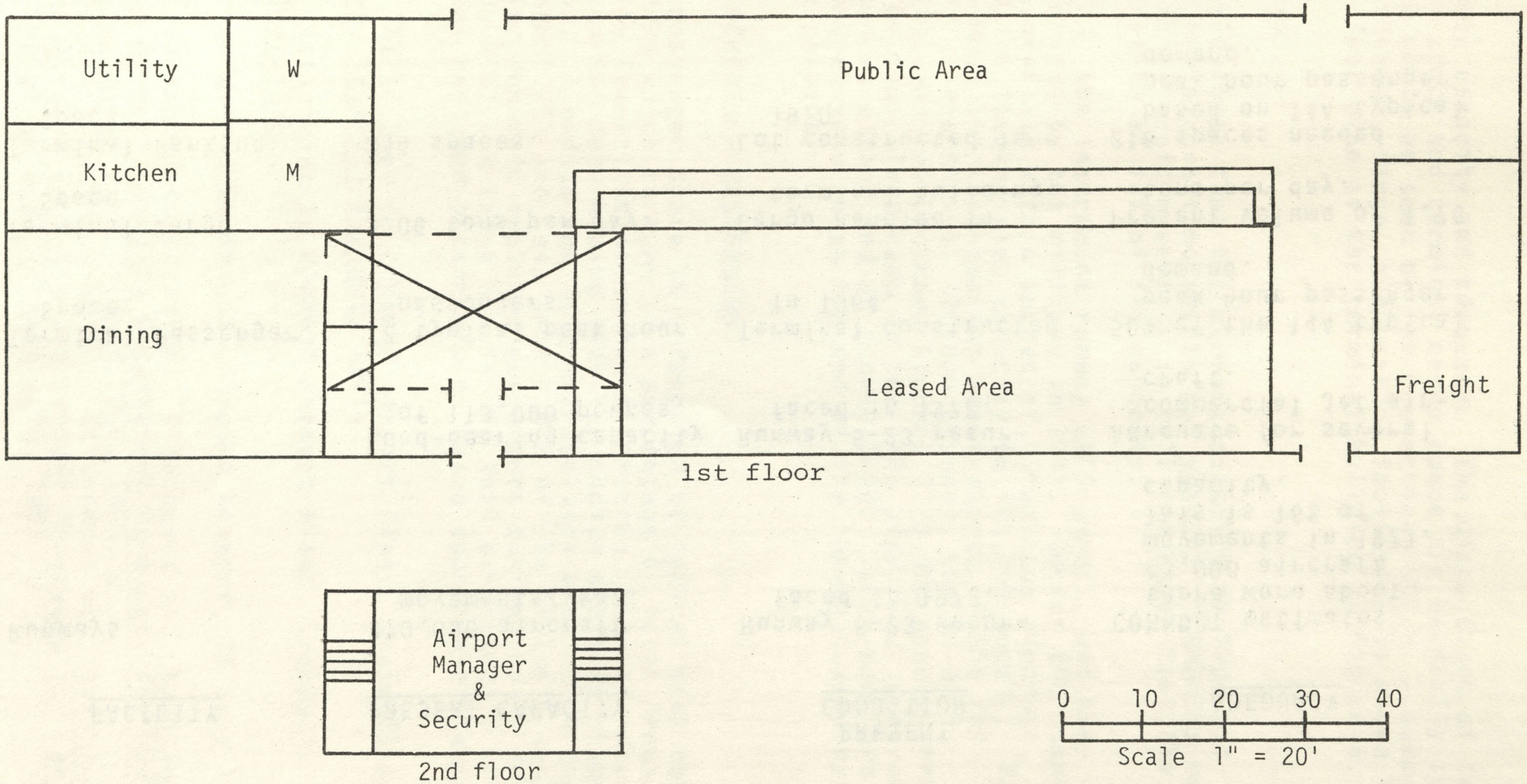

FIGURE 6

Trumbull Airport would be classified as a non-hub.*

TPHP AS A PERCENTAGE OF ANNUAL PASSENGERS

	Medium Hub**	Large Hub***
Greater than 100,000 Annual Passengers	.13	.065
Less than 100,000 Annual Passengers	.20	.12

Using 1969 total commercial passengers and the percentage for medium hubs, CONNDOT arrived at the figure of 144 TPHP. The terminal at Groton, constructed in 1964, consists of 9,699 square feet of usable floor space of which 612 square feet is allocated to freight. This usable space includes dining and kitchen facilities, rest rooms, ticketing lobby and passenger service counters, baggage, waiting room, car rental, and other operating and office space but does not include the Airport Manager's office or security. The FAA requirement for usable floor space per TPHP is 126 square feet for both large and medium hubs. Using these figures, CONNDOT determined that the existing terminal could accommodate 72 TPHP, or one-half of the TPHP demand. Based on these standards another 9,072 square feet of terminal space would be needed to meet the 144 TPHP demand.

The assumption of this State analysis is that .0013 of the annual passengers equals TPHP for Trumbull. Since the FAA does not publish TPHP standards for small or non-hubs, one would have to assume that the medium hub fraction applies to Trumbull if he accepts the deficiency of terminal passenger space. It is possible that Trumbull does handle 144 TPHP or more during some single peak hour during the year based upon existing schedules. There is presently a one-hour period during which four flights

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* Ekse and Hennes. Fundamentals of Transportation Engineering, 2nd ed., p. 192.

** Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 12.

*** Aviation Demand and Airport Facility Requirement Forecasts for Large Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 12.

arrive or depart which, if fully loaded, would account for 140 people. In addition, there are two one-hour periods during which six flights arrive or depart which, if fully loaded, would account for 180 people, or if 80% loaded, 144 people. Thus it is quite possible that within some particular one-hour period during busy holidays, such as Christmas or New Years when planes operate near capacity, that Trumbull may meet or exceed the TPHP as determined by the State. The Airport Manager indicated that this is the case during busy periods such as holidays or Submarine Base graduations.*

TERMINAL REQUIREMENTS - CARGO

The FAA guideline for terminal cargo space for both large and medium hubs is 200 square feet per ton of cargo handled over a 24-hour period.** If one assumes that this standard also applies to non-hubs, then Trumbull's present 612 square feet of cargo area could handle 3.06 tons over a 24-hour period. If one further assumes an average of 22 working days a month and a relatively even distribution of cargo throughout the year, then Trumbull's 1970 cargo volume translates into 1.76 tons over a 24-hour period or well within (57%) its 3.06-ton capacity. Under these assumptions, when cargo increases beyond 3.06 tons per day or if the present cargo space is utilized for passenger space new cargo facilities will be needed.

TERMINAL FACILITIES - PARKING

The FAA guideline for terminal public parking space is 1.5 spaces per TPHP for large and medium hubs.*** If this standard is applied to the TPHP for Trumbull, then 216 spaces would be needed. This is 87% of the existing 244 public parking spaces at the Airport and, in addition, there are 51 employee parking spaces.

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* Conversation with John Raissi, Trumbull Airport Manager, April, 1972.

** Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 20.
Aviation Demand and Airport Facility Requirement Forecasts for Large Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 20.

*** Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 14.
Aviation Demand and Airport Facility Requirement Forecasts for Large Air Transportation Hubs Through 1980, op. cit., Appendix 2, p. 14.

OTHER FACILITIES

Other ground facilities include service and repair facilities, tiedowns, fuel, hangar space, and fire fighting equipment.

In addition, the localizer, guide slope, and middle marker components of an instrument landing system have been installed and are operational. An approach lighting system is depicted on the State Plan (Figure 13) and is discussed in Chapter VI. An air traffic control tower is scheduled for completion by the FAA during 1973.

III. EXISTING ALTERNATIVE MODES OF TRANSPORTATION

INTRODUCTION

This section will evaluate present alternative passenger transportation facilities to assess the effectiveness of each mode. The existing modes from this Region are train, bus, plane and private automobile. Each of these was compared for the cities shown in Table 3. These cities are not meant to be all-inclusive, but were chosen merely because people do travel to them from this Region, and they are all served by existing modes of transportation. In addition, alternative air service is available at airports outside Southeastern Connecticut and is compared with service from Trumbull Airport.

METHODOLOGY

Computations for train, bus, and plane were made from New London and Groton, respectively, because the terminals for these modes are located there. Interstate Route 95 between Groton and New London (Goldstar Bridge) was chosen as the point of origin for the private automobile category to be commensurate with the origins of the public modes. The person living in New London or west of the Thames River has a time advantage if driving to the bus or rail terminals and the person residing in Groton or east of the Thames River a time advantage if commuting to the Airport. Since travel time varies depending where one resides in the Region, these commuting times are not included in Table 3 and Figure 7. Included in the times for bus, plane, and train are 15 minutes for ticket purchase and check in. Times shown are from New London and Groton to the downtown of the destination city, which for rail and bus are transit times, since these terminals are located in downtown areas. For air transportation, commuting times between downtown and the destination airport were added to air transit time to arrive at the Groton to downtown times because airports in Boston, New York, and Washington are located outside the center city. Each of the modes was compared on the basis of frequency of service,* time in transit,** and cost. It should be noted that the cost figures for automobile are constant whether there are one, two, or six persons in the vehicle and that the cost figures for all other modes are per unit costs which increase depending upon the number of persons traveling. The times shown assume that no adverse weather conditions affect the operations of each mode, that all equipment is serviceable and in operation, and that there is no delay of planes at major airports.

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* Frequency was based upon service listed in the following timetables: Bus - 5 January 1972; Rail - 14 November 1971; Air - 1 January 1972 and 15 December 1971.

** Times are written as follows: 2:45, which reads as 2 hours and 45 minutes.

In addition to transit time, frequency of service and cost, factors such as reliability of service, the ability to work, sleep, read, etc., enroute, and the level or quality of service affect one's choosing of a particular mode. How one apprehends or perceives these terms as they apply to a particular mode will affect his value judgements in determining which mode to utilize. These value judgements are difficult to determine and evaluate yet play a very real role in selecting a particular mode.

ALTERNATIVE TRANSPORTATION FROM SOUTHEASTERN CONNECTICUT

SERVICE TO NEW YORK CITY

BUS: Fifteen buses are scheduled between New London and New York City, of which eleven are daily and four are non-daily, the latter generally operating on weekends only. Of the daily trips, five are nonstop with a one-way time of 3:00. The remaining six daily buses make limited stops with times ranging from 3:18 to 3:37, including one local with a 4:54 time. Of the four non-daily buses, one is nonstop with a one-way time of 2:55, two are nonstop with a one-way time of 3:00, and one makes limited stops with a time of 3:25.

In terms of frequency, bus transportation offers the most service of the public modes. But if one is time conscious, the seven buses which make enroute stops increase the travel time by 18-37 minutes over the nonstop service, leaving only eight buses with the quickest one-way travel times. Bus transportation is the cheapest of the commercial modes with a one-way cost of $6.20 and round trip fare of $11.80.

TRAIN: Between New London and New York City there are ten scheduled trains, of which five operate daily and five are non-daily. The latter generally operate five or six days a week. Of the daily trains, three make one or two stops and two make four stops. Times of those making one or two stops range from 2:42 to 2:48 while those making four stops range from 2:51 to 2:56. One of the non-daily trains is the Turboservice operating Monday through Friday with a time of 2:24 and one stop in New Haven. The four remaining non-daily trains make either four or five stops and have times ranging from 2:53 to 3:04. In general, the travel times of those trains making four-five stops is not that much greater than those making one or two stops. (The Turboservice is an exception to this.) Two of these are less than 10 minutes slower than the average time of those making one or two stops, three are 11 minutes slower, and only one is 19 minutes slower. Unlike the time difference between those buses which stop and those which are nonstop, the time difference between those trains making one or two stops and those making four-five stops is smaller and less likely to affect the time-conscious person. Rail trans-

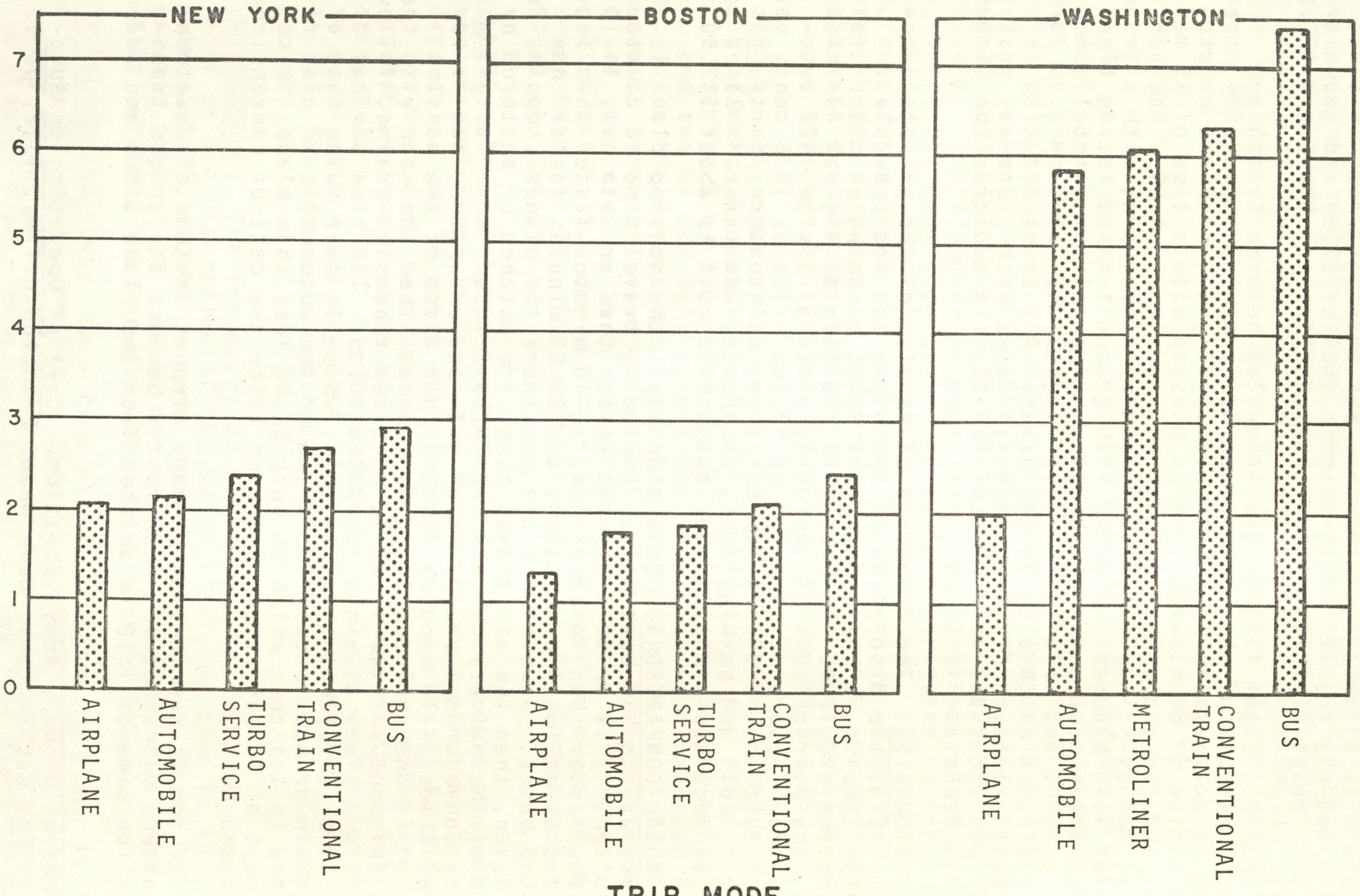
TABLE 3: PRESENT ALTERNATIVE MODES OF TRANSPORTATION

MODE	Service to New York City: Time One Way	Service to New York City: Cost One Way	Service to Boston: Time One Way	Service to Boston: Cost One Way	Service to Washington, D.C.: Time One Way	Service to Washington, D.C.: Cost One Way
Plane	2:05 nonstop 2:10 nonstop 2:20 one stop 2:30 one stop	$19.50	1:20 nonstop	$18.50	1:59 nonstop 2:30 one stop 2:31 one stop 3:50 two stops	$39.75
Bus	2:55 nonstop 3:00 nonstop 3:18 to 4:54 one or more stops	$ 6.20	2:25 to 4:50 one or more stops	$ 5.91	7:25 to 9:35 one or more stops	$17.40
Train	2:24 Turbo-service 2:42 to 3:04 one or more stops	$ 8.90 Turboservice $ 7.00 Coach	1:51 Turbo-service 2:05 to 2:15 three or more stops	$ 7.00 Turboservice $ 6.00 Coach	6:02 to 6:05 Metroliner 6:18 to 7:01 three or more stops	$25.90 Metroliner $20.90 Coach
Auto-mobile	2:10	$17.50	1:50	$15.37	5:50	$48.97

NOTES: The point of origin for Bus and Train is New London, Connecticut; for plane, Groton, Connecticut; for automobile, New London-Groton, Connecticut.
Travel times and fares are from point of origin to the downtown of the Destination City.
The following limousine fares are included in the plane fares: New York - $2.50, Boston - $1.50, and Washington - $1.75.
Times read as follows: 2:45, 2 hours and 45 minutes.
Plane, bus, and train times include 15 minutes for ticket purchase and check in.

SOURCE: Timetables of the various modes: Bus, 5 January 1972; Train, 14 November 1971; Plane, 15 December 1971 and 1 January 1972.
Limousine fares from Official Airline Guide, 1 February 1972.

TRIP TIMES OF PRESENT ALTERNATIVE MODES OF TRANSPORTATION



NOTE: Points of origin: bus and train-New London, Ct.; airplane-Groton, Ct.; automobile-New London/Groton, Ct.
Travel times are from point of origin to the downtown of the destination city.
Times shown are the fastest for each mode.

SOURCE: Timetables: bus, 1/5/72; train, 11/14/71; airplane, 12/15/71 and 1/1/72

FIGURE 7

portation is slightly greater than bus transportation in cost, with a one-way regular coach service cost of $7.00 and round trip $14.00. Respective figures for Turboservice are $8.90 and $17.80.

PLANE: Eight flights are scheduled between Groton and Kennedy Airport of which seven are daily and one non-daily, operating on weekdays only. Of the daily flights, five are nonstop with a time of 60 minutes, one is nonstop with a time of 55 minutes, and one stops in New Haven with a time of 1:20. The non-daily, Monday-Friday flight also stops in New Haven with a travel time of 1:10 minutes. Another 1:10 ground transportation time to Manhattan must be added to flight time, giving a total commuting time of 2:05 and 2:10 for nonstop flights and 2:20 and 2:30 for those flights which stop in New Haven. Air transportation is the most expensive of the commercial modes with a one-way cost of $17.00 and round trip fare of $34.00. In addition the limousine cost to Manhattan is $2.50.

AUTOMOBILE: The frequency of service of the private automobile is at the discretion of the owner and not scheduled. Driving time is in the vicinity of 2:10, assuming no major traffic congestion problems. According to the Federal Highway Administration, the average cost of operating a standard size 1972 automobile for 5 years for a total of 59,900 miles is 14.5 cents per mile. This cost includes depreciation, maintenance, parts, gas and oil, toll and parking fees, insurance, and taxes.* Based upon this average cost, the one-way automobile cost is about $17.50.

MODAL COMPARISONS: On a time basis the nonstop plane is the fastest way to New York City. Including travel time to downtown Manhattan, it is up to 5 minutes faster than private car, 14-19 minutes faster than Turboservice, 35-40 minutes faster than regular trains making 1 or 2 stops, and 50-55 minutes faster than nonstop buses. However, if one considers the planes stopping in New Haven, then the air travel times are matched or bettered by those of the private car and the Turboservice. Next fastest means is the conventional train, which with one exception, had faster travel times (4-18 minutes faster) than those of the nonstop buses. If one excludes the slower buses, then the mode with the most frequent service is rail, with ten scheduled trains, followed by bus and plane at eight scheduled trips. The time savings of the plane is reflected in its cost, which is over twice that of the train or bus fares. The speed of the automobile is also reflected in its cost which is only $2.00 less than plane, twice the cost of Turboservice, and over twice the cost of conventional train and bus.

If one is destined to Kennedy Airport instead of downtown Manhattan, plane becomes even faster because the ground transportation time of 1:10 is deleted from the plane times and added

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* Federal Highway Administration. Cost of Operating an Automobile, Washington: Government Printing Office, 1972, p. 9.

to the bus and rail times of Table 3 and Figure 7. This makes air transportation 1:10 faster than automobiles, 2:34 faster than Turboservice, 2:52 faster than regular trains, and 3:10 faster than nonstop buses. For this service the one-way automobile cost is $18.15, plane fare is $17.00, Turboservice is $11.40, regular coach is $9.50, and bus is $8.70.

SERVICE TO BOSTON

BUS: Eight buses are scheduled between New London and Boston, all of which require a stopover or transfer in Providence ranging in time from 15 minutes to 2:50. Five of the 8 buses operate daily and 3 are non-daily, the latter operating 6 days a week or on weekends only. The 5 daily trips have times ranging from 2:25 to 3:25, the slowest time due to a 1:15 stopover in Providence. The 3 non-daily buses have times of 2:53, 4:08, and 4:50, the latter two slow times due to long waitovers in Providence during late evening and early morning hours. If the time-conscious person drops the 3 slowest buses because of greater than one-hour holdovers in Providence, then 5 buses are left for his choice. Bus transportation is the cheapest commercial mode with a one-way cost of $5.91 and round trip fare of $11.25.

TRAIN: Ten scheduled trains operate between New London and Boston, of which 6 operate daily and 4 non-daily, the latter usually running 5 or 6 days per week. All of the trains make 3 stops, and two of the dailies and one of the non-dailies make 5 stops. With the exception of the Turboservice with its 1:51 time, the transit times of those making 3 stops versus those making 5 stops are very close with only a maximum 10-minute difference between 2:05 and 2:15. One-way regular coach service costs $6.00 and round trip $12.00. The respective figures for Turboservice are $7.00 and $14.00.

PLANE: Three flights are scheduled between Groton and Logan Airport, of which one is daily and two non-daily operating on weekdays only. All flights are non-stop with a time of 50 minutes. For traveling to downtown Boston another 30 minutes ground transportation time must be added to flight time, giving a total commuting time of 1:20. Air transportation is the most expensive of the modes with a one-way cost of $17.00 and round trip fare of $34.00. The ground transportation fee to downtown Boston is $1.50.

AUTOMOBILE: The frequency of service of the private automobile is at the discretion of the owner. Driving time is in the vicinity of 1:50, depending upon traffic conditions. Based upon the average cost of 14.5 cents per mile as explained under New York City service, the one-way automobile cost is $15.37.

MODAL COMPARISONS: On a time basis, the nonstop plane is the fastest way to Boston, including time to downtown Boston. It is 31 minutes faster than Turboservice, 28 minutes faster than private car, 50 minutes faster than regular trains, and 1:05 faster than the fastest bus. Next fastest means are private car followed by

Turboservice and conventional trains. Bus is the slowest mode with the fastest bus trip 10 minutes longer than the slowest train. The public mode with the most frequent service is rail with 10 scheduled trains, followed by bus at 5 trips, and plane least with 3 trips. Once again, the time savings of the plane is reflected in its cost, which is over 2.5 times that of bus or rail. The cost of automobile is $3.13 less than plane, but over twice that of bus and rail.

SERVICE TO WASHINGTON, D.C.

BUS: For bus service to Washington, D.C., one must take one of the 15 buses discussed earlier to New York, and then transfer in New York to a Washington bus. Taking a nonstop bus between New London and New York does not always lead to the fastest overall time to Washington since 4 of the buses which make stops between New London and New York have faster overall times to Washington than 4 of the buses that are nonstop from New London to New York. Overall trip times vary from 7:25 to 9:35 with the 5 slowest trip times due to either holdovers of over one hour in New York or to the two slowest local trips between New London-New York and New York-Washington. Bus service is the cheapest of the commercial modes with a one-way cost of $17.40 and a round trip fare of $33.10.

TRAIN: Of the 10 trains serving New York from New London, 8 provide service to Washington via either the same train or require a changing of trains in New York. Travel times vary from 6:02 to 7:01 depending upon whether one utilizes a conventional train or the Metroliner between New York and Washington. Generally, the Metroliner cuts travel time by 45 minutes to one hour. Train service is more expensive than bus with one-way regular coach service at $20.90 and round trip at $41.80. Respective figures for the Metroliner Coach are $25.90 and $51.80.

PLANE: Six flights are scheduled between Groton and National Airport, of which 3 are daily and 3 non-daily, the latter operating 5 or 6 days a week or Sundays only. Two of the daily flights are nonstop with a time of 1:34, and the other makes one stop with a travel time of 2:06. One of the non-daily flights makes one stop with a time of 2:05, and the remaining two non-daily flights each make two stops, require a change of planes in Philadelphia, and have a 3:25 time. Ground travel time to downtown Washington is 25 minutes, giving total commuting times in the 1:59 to 3:50 range. In addition, there are two connecting flights which require a change of planes or airlines in Philadelphia with times of 3:39 and 5:37. One-way cost is $38.00 and the round trip fare is $76.00. Limousine fare to downtown Washington is $1.75.

AUTOMOBILE: The frequency of service of the private automobile is at the discretion of the owner. Driving time is slightly less than 6 hours, depending upon traffic conditions. Based upon the automobile cost of 14.5 cents per mile, the one-way automobile cost to Washington is $48.97.

MODAL COMPARISONS: On a time basis all the plane flights are the fastest way to Washington, including travel time to downtown Washington. The nonstop planes are 3:51 faster than private car, 4:03 faster than the fastest train, and 5:26 faster than the fastest bus. Next fastest means are the trains and private automobile followed lastly by bus service. However, even if one excludes the 5 slowest buses, they still offer the most frequent service with 10 scheduled trips followed by 8 scheduled trains and 6 planes. Although the cost differences between plane and bus-train are not as great as for Boston and New York service, plane is still an expensive mode with a cost 1.8 times greater than train service and 2.1 times greater than bus service. Automobile is the most expensive mode with a cost of $9.22 more than plane, 1.9 times more expensive than the Metroliner, 2.3 times more expensive than conventional train, and 2.8 times greater in cost than bus.

GENERAL CONCLUSIONS

Although flying is the most expensive means of travel, it is the fastest mode to each of the three cities. Its time savings is a function of distance with the time savings of the nonstop plane to Washington over 4 hours versus time savings of under one hour (with one exception) for service to New York City and Boston. Indeed, for New York City the Turboservice is only 14-19 minutes slower than plane. This indicates that fast ground transportation is a reasonable alternative to flying for service to Manhattan.

PRESENT ALTERNATIVE AIR SERVICE

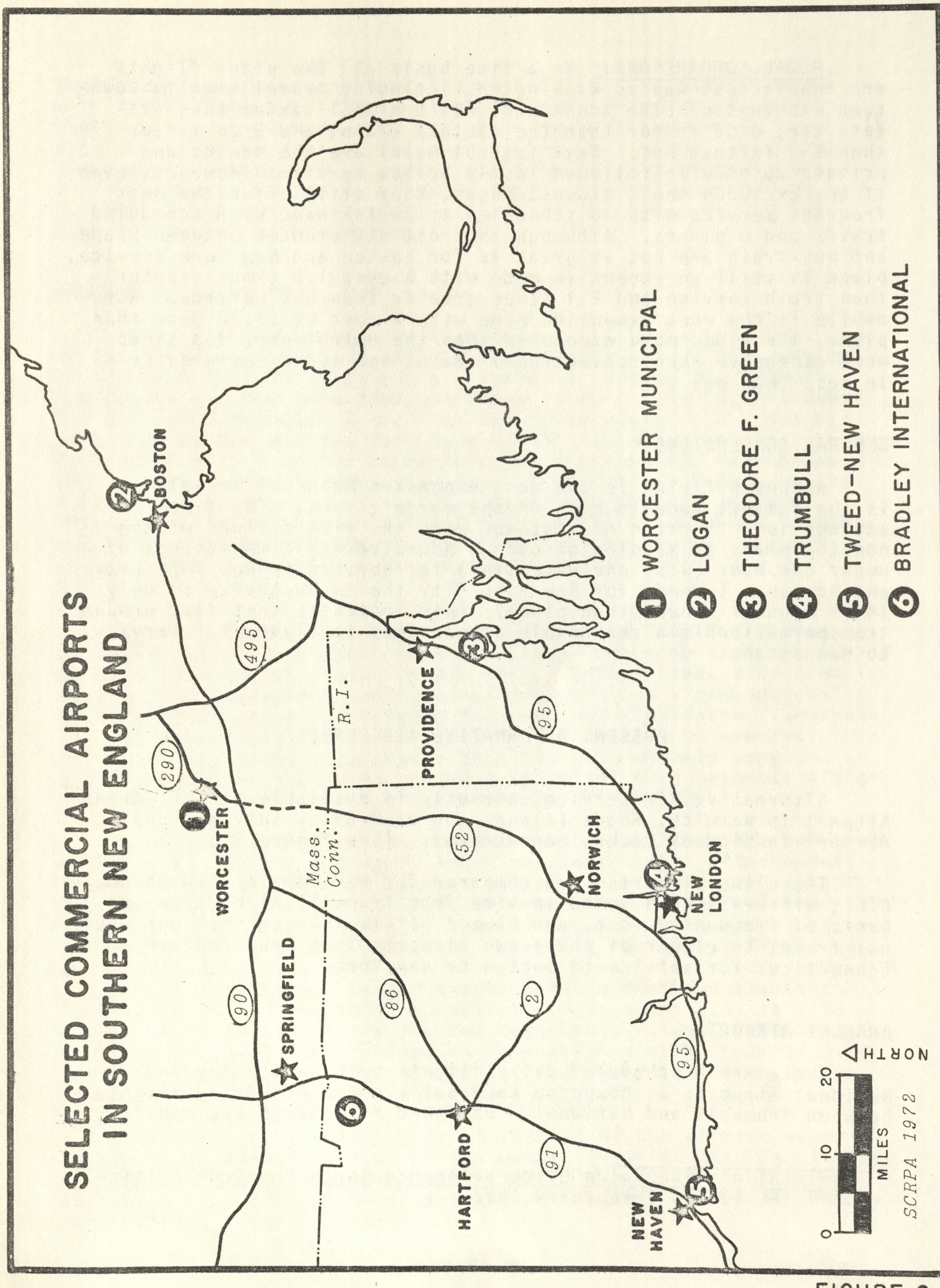
Alternative air service currently is available at T.F. Green Airport in Warwick, Rhode Island, and at Bradley International Airport in Windsor Locks, Connecticut. (See Figure 8.)

These two airports were compared for service to Washington, D.C., vis-à-vis Washington service from Trumbull Airport on the basis of frequency, cost, and time.* It is assumed that one would not travel to either of these two airports from Southeastern Connecticut for service to Boston or New York.

BRADLEY AIRPORT

There are 8 scheduled daily flights between Bradley and National Airports as compared to 3 daily and 3 non-daily flights between Trumbull and National. Of the 8 flights, 5 are nonstop,

* Official Airline Guide Quick Reference North American Edition, Vol. 16, No. 3, 1 February 1972.



SELECTED COMMERCIAL AIRPORTS
IN SOUTHERN NEW ENGLAND
1 WORCESTER MUNICIPAL
2 LOGAN
3 THEODORE F. GREEN
4 TRUMBULL
5 TWEED-NEW HAVEN
6 BRADLEY INTERNATIONAL
BOSTON
WORCESTER
SPRINGFIELD
PROVIDENCE
HARTFORD
NORWICH
NEW LONDON
NEW HAVEN
Mass.
Conn.
R.I.
290
495
90
86
52
95
2
91
0
10
20
MILES
NORTH
SCRPA 1972

FIGURE 8

two make one stop and one makes two stops. Air travel times range from the nonstop time of 1:05 to 2:25 for the flights that make two stops. In addition, there are two connecting flights which require a change of planes and airlines in Philadelphia and Newark with times of 3 hours and 4:30. The one-way fare at $35.00 is $3.00 less than from Groton for comparable service, and round trip is $6.00 less at $70.00

With Norwich as the point of origin, Table 4 shows the overall times to Washington via both Trumbull and Bradley Airports. The two fastest nonstop planes from Groton are still the fastest overall flights to Washington. However, the 5 nonstop flights from Bradley do offer faster times than those making one or two stops out of Groton, while those flights making one or two stops out of Bradley are quicker than those making two stops out of Trumbull. This indicates that from the northern and western sections of the Region Bradley Airport offers faster alternatives to Washington than those flights which make stops between Groton and Washington.

GREEN AIRPORT

Thirteen scheduled flights operate between Green and National Airports, of which 10 are daily and 3 are non-daily, usually operating on weekdays only. Of the 10 daily flights, 3 are nonstop and 7 make one stop, one of which requires a change of planes. The 3 non-daily flights each make one stop, and each requires a change of planes. Air travel times range from 1:07 for the nonstop flights to 2:55 for one of the flights requiring a change of planes. In addition, there are two connecting flights which require a change of planes or airlines in New York with times of 2:46 and 3 hours. The cost for comparable service is the same as the cost from Trumbull at $38.00 one-way and $76.00 for round trip.

With New London-Groton as the point of origin, Table 5 shows the overall time to Washington via Trumbull and Green Airports. The two daily nonstop flights from Trumbull are the fastest overall times to Washington. The 3 nonstop planes out of Green offer faster overall times than those making one or two stops out of Trumbull. This indicates that along Interstate Route 95 in the southern and eastern sections of the Region Green Airport offers faster alternatives to Washington than those flights making one or two stops between Groton and Washington, D.C.

GENERAL CONCLUSIONS

With the exception of the two nonstop flights out of Trumbull, Bradley and Green Airports offer feasible alternative service to Washington, D.C. for the northwestern and southeastern parts of the Region, respectively. In addition, the type of Washington service offered at Trumbull differs from that at Green at Bradley, with

TABLE 4: TRAVEL TIMES FROM NORWICH TO WASHINGTON, D.C., VIA BRADLEY AND TRUMBULL AIRPORTS

Air Time	Total Travel Time	Flight Frequency
BRADLEY AIRPORT		
1:05 and 1:07	2:45 and 2:47	5 daily nonstop
1:50	3:30	2 daily one-stop
2:25	4:05	1 daily two-stop
TRUMBULL AIRPORT		
1:19	2:29	2 daily nonstop
1:50 and 1:51	3:00 and 3:01	1 daily one-stop 1 non-daily one-stop
3:10	4:20	2 non-daily two-stop

NOTES: Times read as follows: 2:45, 2 hours and 45 minutes.

Total travel times for Bradley Airport include 1:15 for travel from Norwich to the Airport and check-in, and 25 minutes for travel time between National Airport and downtown Washington, D.C.

Total travel times for Trumbull Airport include 45 minutes for travel from Norwich to the Airport and check-in, and 25 minutes for ravel time between National Airport and downtown Washington, D.C.

SOURCE: Official Airline Guide Quick Reference North American Edition, Vol. 16, No. 3, 1 February 1972. Allegheny Airline Timetable, December 1971.

TABLE 5: TRAVEL TIMES FROM GROTON-NEW LONDON TO WASHINGTON, D.C., VIA GREEN AND TRUMBULL AIRPORTS

Air Time	Total Travel Time	Flight Frequency
GREEN AIRPORT		
1:07	2:32	2 daily nonstop
1:19	2:44	1 daily nonstop
1:42, 1:44 and 1:46	3:07, 3:09 and 3:11	5 daily one-stop
2:15	3:40	2 non-daily one-stop
2:30 and 2:35	3:55 and 4:00	2 daily one-stop
2:55	4:20	1 non-daily one-stop
TRUMBULL AIRPORT		
1:19	2:14	2 daily nonstop
1:50 and 1:51	2:45 and 2:46	1 daily one-stop 1 non-daily one-stop
3:10	4:05	2 non-daily two-stop

NOTES: Times read as follows: 2:45, 2 hours and 45 minutes.

Total travel times from Green Airport include one hour for travel from New London-Groton to the Airport and check-in, and 25 minutes for travel time between National Airport and downtown Washington, D.C.

Total travel times for Trumbull Airport include one-half hour for travel from New London-Groton to the Airport and check-in, and 25 minutes for travel time between National Airport and downtown Washington, D.C.

SOURCE: _Official Airline Guide Quick Reference North American Edition_, Vol. 16, No. 3, 1 February 1972. _Allegheny Airline Timetable_, December 1971.

turbo-prop planes used out of Trumbull and jet aircraft out of Green and Bradley Airports. Besides the type of service offered, the areas served by Green and Bradley are distinct from that of Trumbull. Trumbull is a feeder airport providing direct flight service normally not exceeding 400 miles, while air carrier service at Green and Bradley Airports is in the trunk, continental, and international categories with trip length hauls up to or greater than 2,000 miles. This is reflected in the number of certificated air carriers operating at each airport with one at Trumbull, 6 at Green, and 7 at Bradley.

IV. CURRENT IMPACT OF TRUMBULL AIRPORT

ECONOMIC IMPACT

For a variety of reasons, many communities actively seek new industry. A transportation facility such as Trumbull Airport is usually considered to be a major asset for a community in attracting industry, although more than one mode of transportation is usually necessary for a community to be in a truly competitive position. Thus, Trumbull Airport can be considered to be an economic asset to Groton and the Region to the degree that it encourages new industry to locate here. However, the degree of this influence varies with different industries and it has not been possible to measure this within the scope of this study.

The same reasoning linking industrial promotion and transportation can also be applied to existing industry; i.e., economic benefit accrues to the Town and Region to the degree that the existing industries depend on Trumbull Airport for service. A survey of eleven major industries and government operations in the area, undertaken by the Groton Planning Office as part of this study, indicated that none had considered Trumbull Airport as a significant factor in locating in the area. Nevertheless, one of the firms surveyed indicated that the Airport had become a significant factor in the development and expansion of their operation in the area, and three others indicated they were major users of the facility. Many of the firms interviewed indicated that the airplane was expected to play a key role in their future, with over 25% of total freight traffic shipments and 75% of passenger travel expected to use airplanes by 1980. It should be noted that the percentages anticipated for freight traffic indicate number of shipments and not volume, for bulk shipments are currently handled by sea, rail, and trucking, and this trend is anticipated to continue.

Of major significance, however, was the importance the industries surveyed placed on the airplane for meeting their customers' "crisis needs," i.e., rush orders, highly perishable products, and correcting shipping errors. In terms of passenger service, the industries interviewed seemed of the opinion that the airplane offers the best means of traveling out of town for their employees and ideal travel accommodations to the area for their customers. Of major importance to those firms interested in the Airport's future was the need to provide a wider range of services, with particular emphasis given to the Midwest, the South, and upstate New York.

Of great importance when considering the results of the industry survey, is the recognition of the economic importance of these statements on the Region as a whole. The eleven industries and institutions surveyed employ approximately 21,000* of the

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* Survey conducted by Groton Planning Office, April, 1972.

72,000 workers in the Region's total civilian non-agricultural labor force.* Total payroll for these firms and institutions in 1970 is estimated at $203 million,** and their total current assessed value for both real and personal property is estimated at nearly $65 million.*** Based on 1970 assessments for the Region, this represents 6.6% of the Region's tax base and 15% of the total tax base of those towns in which these eleven employers are located.

Within the scope of this study it has not been possible to weigh in absolute terms the economic advantage which the Airport offers to industry in Southeastern Connecticut; however, the preceding figures can be considered indicative of the order of magnitude of Trumbull's role in the Region's industrial sector. It should also be pointed out that more of the Region's business-related traffic would be originating at Trumbull if flight arrangements were more suitable and service was more competitive with flights originating from Bradley Airport in Hartford and Green Airport in Rhode Island serving the same destinations. The airlines would, of course, have to determine whether expanded service was economically feasible.

Direct economic return to the Town and Region in the way of revenues is extremely limited, because the Airport is State-owned and operated. This eliminates the real estate from the local tax rolls and leaves personal property as the only direct source of tax revenue to the Town.+ In 1970, $2,730 in personal property taxes from the Airport was received by the Town of Groton, while in contrast, the State received about $115,000 in 1970-71 from operating revenue as shown in Table 6. However, these revenues were totally offset by expenditures for the same period totalling $239,437. The resultant effect was a net loss of $124,426 for the State. Therefore, neither the State nor the Town of Groton receive any significant direct income from the Airport.

One area where the Airport does provide direct economic benefit to the Town and Region is employment. Approximately 200

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* Connecticut Labor Department. <u>Norwich and New London Labor Market Letters</u>, April, 1972.

** Groton Planning Office. <u>op. cit</u>.

*** Groton Planning Office survey of local tax assessors, April, 1972.

\+ Data from the State Tax Department show that in 1971 the Town received a total State grant-in-lieu-of-taxes of $13,194 for all State property in the Town. Trumbull Airport represented 4.9% of the total value of State land holdings in Groton. On a prorata basis, this would indicate that about $650 of the grant-in-lieu-of-taxes was attributable to the Airport.

TABLE 6: TRUMBULL AIRPORT, OPERATING REVENUES AND EXPENDITURES, JULY 1970 - JUNE 1971

OPERATING REVENUE

Residences (Rent)	$ 1,650
Other land and buildings (Leases)	7,907
Warehouses (Leases)	8,252
Terminal building rent	26,205
Hangar rent	6,480
Landing fees	15,325
Vending machines	442
Rental cars (Commissions)	30,665
Restaurant	3,285
Insurance machine	132
Fixed based operation (gas, fees, etc.)	14,668
Total:	$115,011

OPERATING EXPENDITURES

Personal Services (salaries)	$175,235
Other Expenses (materials and supplies)	63,307
Equipment	895
Total:	$239,437

SOURCE: Edward McCormick, State Department of Transportation, Bureau of Aeronautics, April 1972.

people are employed by the Airport operation on a permanent basis, and an additional 85 people come to the Airport for military training one weekend a month. These jobs, especially those which do not pertain to defense, are a welcomed asset to Groton's defense-oriented economy.

Another area of economic impact, and also the most localized, concerns the Airport's effect on surrounding property values. As noted at the start of this discussion, industrial and commercial property generally are quite compatible with a transportation facility such as Trumbull Airport. However, the impact of such a facility on residential areas can sometimes be quite the opposite, with declining property values and strong airport opposition the end results.

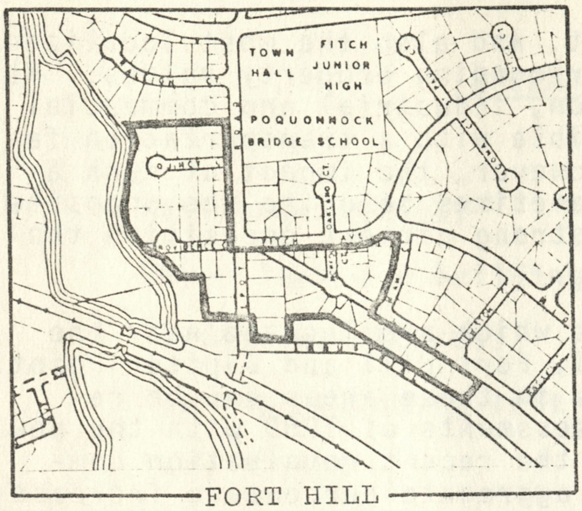
There are two residential areas which are located near the ends of the major runway at Trumbull, Fort Hill and Jupiter Point. Changes or trends in property values in these areas can be revealed by comparing the property assessments of 1959 with the new assessed values which resulted from the recent revaluation completed in 1971. Figure 9 shows the aggregate percentage increase in property assessments in the two areas in question. In addition to these, the same data have been provided for the Bel-Aire neighborhood, an inland residential development, and Groton Long Point, a waterfront residential area, for comparative purposes.

The only conclusion which can be drawn about residential property values in Fort Hill and Jupiter Point is that the positive forces which are at work in the areas so far have more than offset any negative effect resulting from the Airport. This conclusion applies only to the Airport as it exists now. On the basis of the experiences of other communities, careful consideration must be given to possible adverse effects which proposed expansion at Trumbull could have, and also special attention should be given to discourage land uses which are not compatible with the Airport and its use.

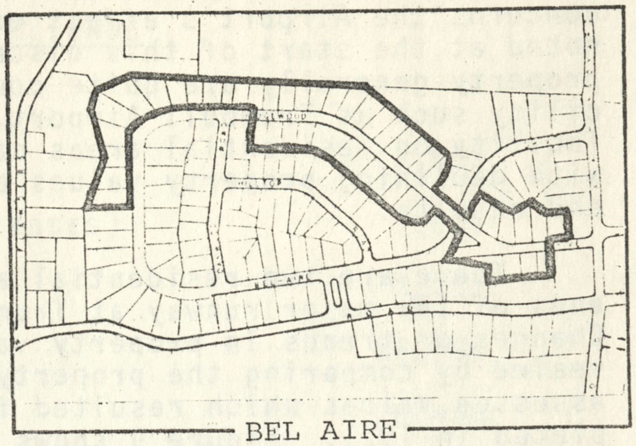
To sum up, we conclude that Trumbull Airport provides only minimal direct revenues to the Town of Groton or the State of Connecticut. Economic benefits, though hard to quantify, seem to exist in the measure of convenience the Airport provides existing and potential industrial firms in meeting their passenger and freight transportation needs. Other economic benefits which must be considered are the 200 jobs provided for the area's labor force and the important role Trumbull Airport plays in meeting the Post Office's commitment to provide one-day service within a 600-mile radius.

This study has not attempted to develop a definitive cost-benefit analysis to evaluate absolute economic impact due to the inconsistencies in data, the unquantifiable economic returns, and limited time. However, the existence of Trumbull Airport within Southeastern Connecticut is sure to play an important role in the area's future economic growth.

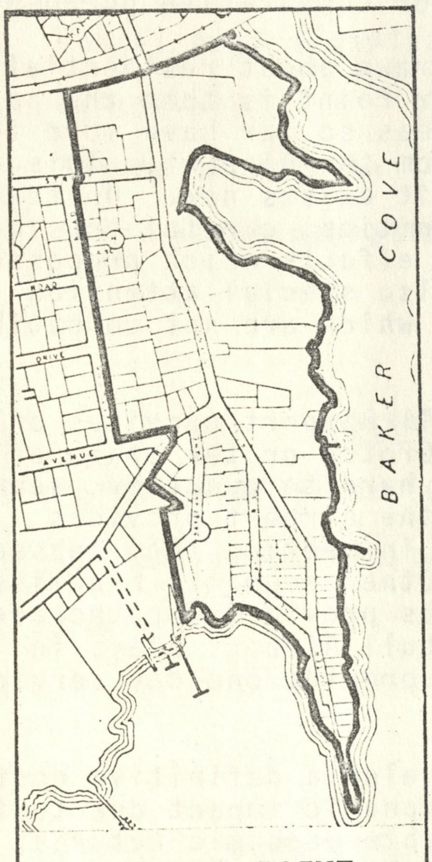
COMPARISON OF PROPERTY ASSESSMENTS
1959 - 1971



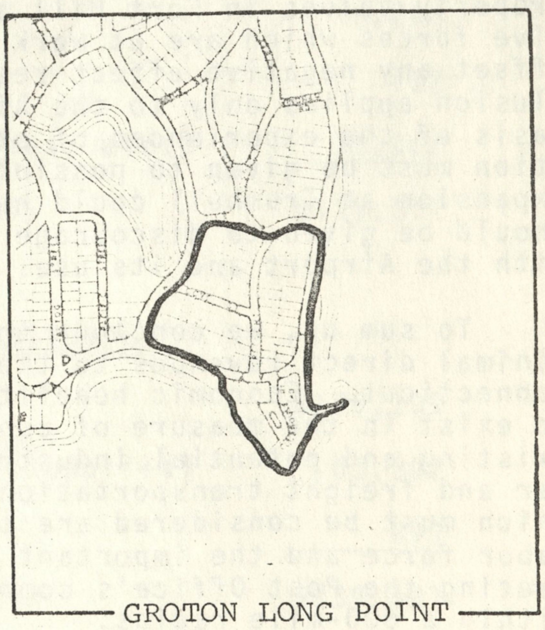
FORT HILL
61 Lots Sampled
57.6%
aggregate percent increase



BEL AIRE
47 Lots Sampled
46.1%
aggregate percent increase



JUPITER POINT
135 Lots Sampled
224.7%
aggregate percent increase



GROTON LONG POINT
72 Lots Sampled
158.8%
aggregate percent increase

SOURCE: Town of Groton Tax Assessor. FIGURE 9

IMPACT ON SECONDARY FACILITIES

ROADS

At the present, the automobile is the only mode of transportation which provides ground access to and from the Airport and the surrounding community. Groton is easily accessible by automobile from almost anywhere in the Region via the major State and interstate routes. However, once in Groton, it is necessary to use smaller secondary and collector streets to reach the Airport. These access roads, South Road, Tower Avenue (State Route 649), and High Rock Road, have had counts of about 3,000 ADT (average daily traffic). With the exception of the flooding which occurs under the railroad bridge on South Road, they are adequate to serve the present level of traffic generated by the Airport. That portion of the access roadway which is located on the Airport property is part of State Route 649 and as such is controlled and maintained by the State. By contemporary design standards, this section of the access route would have to be considered inadequate because of its sharp curves and narrow roadway.

Thus, although the Airport is certainly a traffic generator within the Town of Groton and the Region, it does not appear to have any strong impact on their respective road systems at its present level of operation. The two exceptions to this statement are the flooding problem on South Road which the Town faces and the sharp curves which exist on the State's highway within the Airport property. However, the impact here is only that of increasing the need and pressure to correct situations which were already unsatisfactory.

SEWER AND WATER FACILITIES

Trumbull Airport is presently equipped with its own sewer system which appears to be adequate for present volumes. It provides secondary treatment and discharges its effluent to Birch Plain Creek. It has a design flow capacity of 0.08 MGD, about four times its average present flow.* The ability of this system to handle future growth is unclear at this time. Aside from this existing system, the Town of Groton's overall sewer system plan indicates that it would also provide service to the Airport; however, at this point in time, it cannot be determined when or if this plan will be implemented.** Water is supplied to the Airport by the City of Groton Utilities Department, and they have

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* Metcalf & Eddy. Recommended Regional Sewerage Plan, 1969, p. 22.

** Conversation with Walter Blanker, Town of Groton Public Works Director, April, 1972.

indicated that there is an adequate water supply to support the Airport and future expansion should it take place.* Thus, since the sewer system is presently independent of the Town and the water supply presents no problem, it must be concluded that the Airport currently has no significant adverse impact on the community or Region as far as sewer and water systems are concerned.

PLANNING AND ZONING ADJACENT TO THE AIRPORT

The Town's first zoning map was adopted in June of 1957. At that time the zoning patterns adjacent to Trumbull Airport were basically the same as they are today with three exceptions. The most significant of these changes consisted of major expansion of the R-12 zone in the Fort Hill area to Lily Lane on the south and to include Brookside Village and Indian Field on the north. On the original map the lower half of the Fort Hill Homes area was designated Industrial (IA-40) and the Brookside Village-Indian Field area was designated Rural (RU-20). Other zone changes in the area occurred to the west of the Airport, the IA-40 zone in the Birch Plain Creek area was expanded to the property fronting on High Rock Road, Thomas Road and Tower Avenue which shows as RU-20 on the original map, and the land north of High Rock Road was rezoned from RU-20 to RS-12 (single family). Inasmuch as the Airport operation at Trumbull did not really gear up until the 1960's it is interesting to note that the Airport's impact on zoning patterns in Town is somewhat contradictory to what would be expected. Rather than residential use being discouraged in the adjacent areas, it was allowed to flourish, and zoning for industrial land uses was decreased.

The 1961 Town Plan of Development did little to encourage change of this pattern. It called for the creation of greenbelts on the eastern and western boundaries of the Airport, redevelopment of the Fort Hill Homes area and the creation of an office apartment zone on Route 1 west of Route 117.

From all indications to date, it seems that the Airport has had little if any impact on adjacent land uses. It can be assumed that the low level of use of Trumbull Airport to date has been most significant in this pattern. However, as Airport use increases, the impact such a facility will have on adjacent lands is sure to become critical and attention will be focused on redesignating land uses so as to be more compatible with the Airport environs.

* Conversation with William Clinton, Manager, City of Groton Utilities Department, April, 1972.

IMPACT ON THE EXISTING ENVIRONMENT
AROUND TRUMBULL AIRPORT

In evaluating the existing and future role of Trumbull Airport, it is necessary to consider the natural and man-made features of the surrounding area and their compatibility with aircraft operations. Identification and description of these features are of first-order importance.

NATURAL ENVIRONMENTAL VALUES

The predominant natural features in the vicinity of Trumbull Airport include the Poquonock River Estuary and other tidal wetlands in Baker Cove; the presently undeveloped Bluff Point State Park in which the most significant feature is a barrier beach; and the proposed Birch Plain Creek Open Space area. Aside from geology, little specific data exists on the natural environment around Trumbull Airport. As a result, the following discussion draws largely on the observations and judgements of various scientists who are familiar with the area in general terms.

The wetland areas of the Poquonock River and Baker Cove border the Airport on three sides. Figure 10 shows the boundaries of these wetlands, a total of approximately 360 acres, as determined by the Connecticut Department of Environmental Protection. Under the State Wetlands Act of 1969, any proposed activity which would destroy or despoil any part of a defined area is subject to the approval of the Department of Environmental Protection.

Over the past four years, as Director of the Marine Sciences Program at Connecticut College, Dr. Robert S. DeSanto has conducted a number of field trips to Bushy Point and the Poquonock River Estuary. His description of the area indicates the high quality of this particular marine environment.

> "The diversity and robustness of the marine life which I have found in and about the marsh is becoming rarer in the Sound and in this respect, the estuary is somewhat unique and ecologically important. In addition to my professional use of the marsh and estuary as a teaching laboratory for my students, the site is potentially and actually valuable as an area for recreational shellfishing and crabbing. It also serves as a natural hatchery and/or nursery for a number of important sport and food fish species."*

Dr. W. Frank Bohlen, of the Marine Sciences Institute of the

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* Letter from Robert S. DeSanto, Ph.D., Zoology Department, Connecticut College, New London, Connecticut, February, 1972.

University of Connecticut at Avery Point, notes another important use of the area.

> "The Poquonock River, as a Class A river [and Class SB estuary], provides a valuable control for water quality studies in adjacent waters. Without such a standard it is often difficult to estimate the extent of pollution-induced deterioration in a coastal ecosystem. The proposed studies of Long Island Sound and the Thames River will find such a standard extremely valuable."*

Bluff Point State Park lies to the east and south of Trumbull Airport. Plans for the park envision heavy use of the beach area for swimming and less intensive use of the upland forested areas for picnics, hikes, and panoramic viewing of Long Island Sound.** Implementation of these plans, however, will not occur until direct access is provided from major highways to the park. The Department of Environmental Protection has recently indicated that the Morton Fine Plan will be reexamined carefully before any final decision is made on the types of activities to be developed at the park.

The beach at the State Park extends westward from the Bluff Point headlands toward Bushy Point Island in a long, narrow arc, known geologically as a barrier beach. The beach was formed largely by tidal action and gradual erosion of the Bluff Point headland. Over the years, bedrock of the headland became exposed and erosion of the headland lessened. Subsequently, with a greatly reduced supply of shore material, the beach has steadily retreated landward.***

Richard Goldsmith of the U.S. Geological Survey, who mapped the surficial and bedrock geology of the area, made several comments on the value of the barrier beach.

> "It is not really unique as other such features exist up and down the coast. However, Bluff Point beach is noteworthy in that it is a good example of a barrier beach or bay mouth bar that is presently undeveloped and uninhibited by engineering structures."+

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* Letter from W. Frank Bohlen, Ph.D., Marine Sciences Institute, University of Connecticut, Avery Point, Groton, Connecticut, January, 1972.

** Morton S. Fine and Associates. Bluff Point, Master Plan Study, April, 1965.

*** Army Corps of Engineers. Pawcatuck River to Thames River, Connecticut, Beach Erosion Control Study, 1952, p. 16-17.

\+ Letter from Richard Goldsmith, Ph.D., Chief, Branch of Atlantic Environmental Geology, U.S. Geological Survey, December, 1971.

HUMAN AND ENVIRONMENTAL VALUES AROUND TRUMBULL AIRPORT, 1971

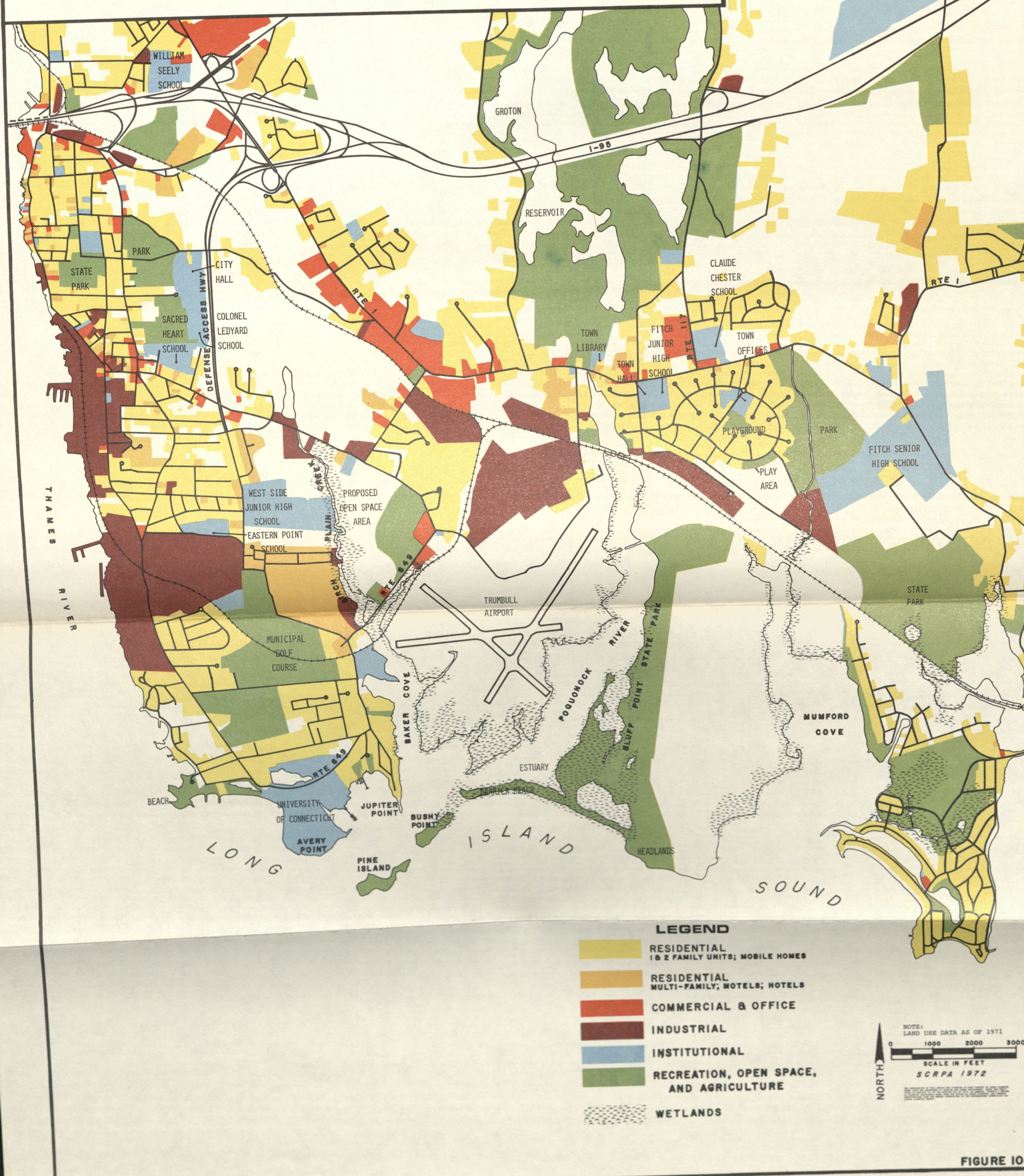

FIGURE 10

Dr. Goldsmith also feels that the beach and the variety of other natural phenomena in the immediate vicinity have considerable potential for educational field trips.

William A. Niering, Professor of Botany at Connecticut College and Director of the Connecticut Arboretum, also sees the barrier beach as a resource with considerable recreational value.

> "Properly planned, thousands of people can use portions of the sandy beach (intertidal zone) with minimum impact on the barrier beach as a whole. However, it would be desirable to designate some remote portion which will not be exposed to the masses."*

The Army Corps of Engineers have also indicated the suitability of the barrier beach for recreational use.**

An area along Birch Plain Creek, as shown on Figure 10, is presently proposed as an open space area, to be acquired by the Town of Groton, "for the purpose of its preservation, passive recreational and educational use."*** A grant reservation for 50% of the acquisition cost has been made by the Federal Department of Housing and Urban Development, awaiting approval of a State grant for an additional 25%. A large portion of the tract consists of valuable tidal marshes. In addition to providing a diverse wildlife habitat, the "stream [and marshes] provide natural storm run-off land and protection against sea storms."+

HUMAN ENVIRONMENTAL VALUES

The simplest means for identifying and classifying man-made development is by land use categories. Figure 10 shows a general breakdown of the area around Trumbull Airport according to residential, institutional, recreational, commercial, and industrial uses.

Due to the activities associated with them, residential and institutional uses are the most sensitive to external disturbances. The residential categories include both single- and multi-family housing, while the institutional category includes

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* Letter from William A. Niering, Ph.D., Botany Department, Connecticut College, New London, Connecticut, December, 1971.

** Army Corps of Engineers, <u>op</u>. <u>cit</u>., p. 17.

*** Groton Conservation Commission. <u>Birch Plain Creek, Open Space Proposal</u>, December, 1970.

\+ Groton Conservation Commission. <u>A Conservation Plan for Groton, Connecticut</u>, April, 1969, p. 12.

places of public or semi-public use, such as schools, governmental facilities, libraries, and churches.

Outdoor recreational areas and retail commercial facilities exhibit a greater tolerance to external impact than do residential and institutional uses but do reach a limit beyond which normal activity is interrupted. Most industrial activity can tolerate a high level of external disturbance.

By looking at Figure 10, the areas of greatest development around Trumbull Airport can be readily located. West of the Airport is the City of Groton, which has a mixture of land uses. In closest proximity to the Airport are areas of concentrated residential development. A second area of concentrated development can be observed to the northeast of the Airport in Poquonock Bridge. Residential and institutional uses predominate here.

IMPACT ON THE NATURAL AND HUMAN ENVIRONMENTS

As with any major development, an airport creates an impact on the community and region in which it is located. The economic effects described in the previous section are felt by the Town and Region. However, the environmental effects tend to be concentrated in the immediate vicinity of the Airport.

The main items of environmental concern around Trumbull Airport include air and water pollution, crash potential, and noise. Each of these areas will be discussed in relation to the Airport and its environs. Because noise has the greatest impact on airport neighbors it will be treated in considerable detail.

AIR POLLUTION: Aircraft exhaust emissions are basically of the same composition as automotive emissions. Concern regarding pollution by aircraft, particularly in the vicinity of major air terminals, has grown considerably over the past decade.

A report published by the Secretary of Health, Education, and Welfare in 1969 estimated that "aircraft emissions...constitute between 0.1 and 1.3 percent of all carbon monoxide, hydrocarbons, oxides of nitrogen, and particulate emissions"* in the metropolitan areas near airports and in the nation as a whole. In the immediate vicinity of a major air terminal, aircraft may contribute as much as 10 percent of the total pollution.**

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* Secretary of Health, Education, and Welfare. Nature and Control of Aircraft Engine Exhaust Emissions, Senate Document No. 91-9, Washington, 1969, p. 20.

** William H. Megonnell. "Regulation of Pollutant Emissions from Aircraft - Today and Tomorrow," Conference Proceedings, Conference on Aircraft and the Environment, Part II, Society of Automotive Engineers, Inc., and U.S. Department of Transportation, 1971, p. 54.

Although we do not have specific data on Trumbull Airport's contribution to air pollution, it seems likely it is substantially below the percentage contribution of a major airport.

There is likely to be continued pressure for stronger regulations over aircraft emissions. The responsibility for establishing such standards rests with the Federal Government. Section 233 of the Federal Clean Air Act of 1970 specifically states that: "No state or political subdivision thereof may adopt or attempt to enforce any standard respecting emissions of any air pollutant from any aircraft or engine unless such standard is identical to a standard applicable to such aircraft under this part."

Being a relatively small air terminal, Trumbull Airport has not created a serious air pollution problem in Groton. Any standards established by the Federal government and/or any improvements made by the airlines and aircraft industry will undoubtedly benefit the Groton area, but there does not appear to be a need for local action at the present time.

WATER POLLUTION: Potential sources of water pollution at an air terminal include fuel and oil spills, runoff from runways and taxiways, sanitary sewage, and disturbance of natural drainage patterns. These problems tend to vary in degree according to the size and location of an airport and the types and number of aircraft operations.

No fuel or oil spills originating with aircraft or Airport facilities have been recorded at Trumbull Airport. Storage facilities for fuel are located underground, northwest of the northern end of the main runway. Gas trucks are used in transporting the fuel to the aircraft. Oil is stored in drums kept in the hangars. With proper maintenance and usage, these facilities do not appear to present a serious water pollution threat.

Storm runoff from runways and taxiways undoubtedly carries small amounts of fuel and oil, along with de-icing agents during cold weather. Drainage ditches on the Airport property direct the runoff from the paved areas towards Baker Cove, Birch Plain Creek, and the Poquonock River.

The quality of the marine life around the Airport is the best indicator regarding any adverse impact of the runoff. As described earlier, field surveys conducted by Dr. Robert DeSanto identified a healthy and diverse environment in the Poquonock River Estuary. Therefore, with the existing conditions at Trumbull Airport, there does not appear to be a serious pollution problem from storm runoff.

Sanitary sewage from the Airport, including the Transportation Battalion and general aviation facilities, is collected at a sewage treatment plant on the Airport property. After secondary treatment, the effluent is discharged into Birch Plain Creek.

Though it is currently a low priority item, the Town of Groton's sewer system plan indicates that the Airport sewer system will eventually be connected to the Town-wide sewer system. At that time the existing treatment plant will be abandoned.

The natural drainage patterns around the Airport have adapted to the existing facilities. The extensive wetlands surrounding the Airport act as a natural reservoir during periods of heavy rainfall and/or high tides, so far preventing any flooding problems in the area.

CRASH HAZARDS: In the early 1950's, a governmental investigation into airplane crashes reported that most accidents occurred in a direct line within one-half mile of the end of the runway.* As a result of this finding, clear zones have been established at most airports. This is a specified area extending from the end of each runway in which no construction is permitted. Trumbull Airport has FAA approved clear zones at the end of each runway.

Trumbull Airport also has certain equipment and operational standards that are designed to prevent aircraft accidents. Minimum visibility and ceiling requirements for landings are set by the Federal Aviation Administration and vary for each runway according to the navigational aids present and the local topography. The recently installed Instrument Landing System on Runway 5 now permits a straight-in approach over the water during adverse weather conditions. Previously, a circling pattern over the Town preceded approach to the runway in order to establish visual contact with the runway. The new equipment lessens the probability of aircraft crashes in developed areas around the Airport. Medium-intensity lights along the runways at Trumbull Airport also aid the pilot in establishing visual contact with the runway during the night or during adverse weather. If a crash should occur, firefighting equipment is located at the Airport.

No matter how much safety equipment is available or what standards are established, the skill and judgment of a pilot and the condition of his aircraft are still central to the prevention of airplane crashes. Standards and equipment are useful only as long as they are followed and used correctly.

IMPACT OF NOISE: Since the introduction of jet aircraft in the 1950's, noise has been a problem of major concern to Airport neighbors. Research begun in 1952 has developed and revised methods for estimating aircraft noise, as it relates to community

* Michael J. Meshenberg. Planning the Airport Environment, ASPO Planning Advisory Service, Report No. 231, 1968, p. 6.

reactions, for use in airport and community planning.*

The Composite Noise Rating was the first procedure developed. In its original form, the procedure attempted to relate noise in general to community response. Continuing research throughout the 1950's and 1960's led to refinement of the Composite Noise Rating for specific application to aircraft operations. Further modifications resulted in the development of a new procedure in 1967, entitled Noise Exposure Forecasts. This has since become a commonly used method for predicting community reactions when dealing with noise produced by aircraft, although it has not been officially accepted by the Federal Aviation Administration.

The Noise Exposure Forecast (NEF) procedure takes into consideration the physical characteristics of the aircraft noise, the frequency of aircraft operations, the time of day during which the operations occur, and operating characteristics of the given airport (such as runway length and the angle of approach). A complex mathematical process** evaluates these factors and arrives at a numerical NEF value which can be related to compatible and incompatible land uses.

The NEF values are usually presented on a map using contour lines to indicate various levels of noise exposure. The lines are plotted in relation to the position of the runways and established traffic patterns.

Many variables enter into the computation of NEF values, each of which can to a degree alter the final outcome. Though careful judgment is used in preparing the input for the NEF calculations, the resultant contours must not be viewed as precise boundaries but rather as guides in evaluating the impact of aircraft noise and in planning land uses around the Airport.***

The NEF contours generally shown on maps range in value from 25 to 40. Table 7 relates Noise Exposure Forecasts from 0 to 40 with various familiar noises. For example, a jet flyover

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* Information regarding the development of noise measurement techniques was obtained from: William J. Galloway and Dwight E. Bishop. Noise Exposure Forecasts: Evolution, Evaluation, Extensions, and Land Use Interpretations, Bolt, Beranek and Newman, Inc., for the Federal Aviation Administration, August, 1970, pp. 1-30.

** Bolt, Beranek and Newman, Inc. A Digital Computer Program for Computation of Noise Exposure Forecast Contours. Van Nuys, California, n.d.

*** Bolt, Beranek and Newman, Inc. Land Use Planning Relating to Aircraft Noise, October, 1964, p. 1.

TABLE 7: SOUND LEVELS AND LOUDNESS OF ILLUSTRATIVE NOISES IN INDOOR AND OUTDOOR ENVIRONMENTS (A-Scale Weighted Sound Levels)*

dB (A)	Over-All Level (Sound Pressure Level Approx. 0.0002 Microbar)	Community (Outdoor)	Home or Industry (Indoor)	Noise Exposure Forecast For 20 Occurences Of 10 Seconds per Day
130	Uncomfortably Loud	Military Jet Aircraft Take-Off with After-Burner from Aircraft Carrier at 50 Ft. (130)	Oxygen Torch (121)	
120		Turbo-Fan Aircraft at Take-Off Power at 200 Ft. (118)	Riveting Machine (110) Rock'n-Roll Band (108 - 114)	
110	Very Loud	Jet Flyover at 1000 Ft. (103) Boeing 707, DC 8 at 6080 Ft. before Landing (106) Bell J-2A Helicopter at 100 Ft. (100)		40 (103)
100		Power Mower (96) Boeing 737, DC-9 at 6080 Ft. before Landing (97) Motorcycle at 25 Ft. (90)	Newspaper Press (97)	30 (93)
90	Moderately Loud	Car Wash at 20 Ft. (89) Prop. Plane Flyover at 1000 Ft. (88) Diesel Truck, 40 MPH at 50 Ft. (84) Diesel Train, 45 MPH at 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	20 (83)
80		High Urban Ambient Sound (80) Passenger Car, 65 MPH at 25 Ft. (77) Freeway at 50 Ft. from Pavement Edge, 10 A.M. (75 ± 6)	Living Room Music (76) TV Audio, Vacuum Cleaner (70)	10 (73)
70		Air Conditioning Unit at 100 Ft. (60	Cash Register at 10 Ft. (65-70) Electric Typewriter at 10 Ft. (64) Dish Washer (Rinse) at 10 Ft. (60) Conversation (60)	0 (63)
60	Quiet	Large Transformers at 100 Ft. (50)		
50		Bird Calls (44) Lower Limit, Urban Ambient Sound (40)		
40	Just Audible	dB (A) Scale Interrupted		
10	Threshold of Hearing			
0				

* Adapted from Branch, Melville, C., et. al., "Outdoor Noise and the Metropolitan Environment," Department of City Planning, Los Angeles, California (1970), as presented in Connecticut Port Authority Study Commission - Final Report, prepared by Charles A. Maguire and Associates, 1972.

at 1,000 feet, occurring 20 times during the day for a duration of 10 seconds each time would yield a NEF of 40. The purpose of this table is to provide a general understanding of Noise Exposure Forecasts and does not reflect the current situation at Trumbull Airport.

Once Noise Exposure Forecast contours have been established for an airport it is possible to evaluate the impact of the aircraft noise on surrounding land uses. The guidelines presented in Table 8 indicate general cut-off points where the level of aircraft activity and noise become incompatible with specific types of land use.

In applying these guidelines, there are two things to keep in mind. First, within a general land use category, the noise sensitivity of specific land uses may vary considerably (i.e., hospital vs. movie theater). Therefore, it is necessary to evaluate each proposal on an individual basis.

Second, the guidelines have been developed on the basis of previous experience in the urban areas around major airports.

TABLE 8: LAND USE IMPLICATIONS OF NOISE EXPOSURE FORECASTS*

Land Use Category	Approximate NEF value where new construction or development is not desirable
Residential - 1 and 2 family units; mobile homes and Institutional	30
Residential - multi-family; motels	35
Commercial and Office Recreational - parks and playgrounds	40
Recreational - golf, horseback riding, water-based recreation and Open Space	45
Industrial	50

* Adapted from: Galloway and Bishop. op. cit., Part II, pp. 3, 4 and Airport Environs: Land Use Controls, Environmental Planning Paper, U.S. Department of Housing and Urban Development, May, 1970, pp. 33-35.

Being predominantly suburban in nature, Groton is likely to be more sensitive to aircraft noise than indicated by the table. In this respect, a 25 NEF may be a more realistic cut-off point for new residential development than a 30 NEF.*

In August, 1971, the U.S. Department of Housing and Urban Development (HUD) issued a circular establishing noise standards to be used in the approval or disapproval of all forms of HUD assistance.** New residential construction, both single and multi-family, in areas with a NEF of 40 or greater is considered unacceptable. Between 30 and 40 NEF, permission to undertake new construction is discretionary. However, an approval by HUD within this area requires noise attenuation measures, the Regional Administrator's approval, and an environmental impact statement. Areas with a NEF below 30 are considered acceptable for HUD support.

With respect to modernization of existing construction, HUD has two policies. If the buildings can be improved with regard to noise without greatly increasing the life of the structures, HUD will encourage support of the project. However, if major rehabilitation is involved which would substantially extend the life of the structures, standards similar to those for new construction must be met.

Figure 11 shows the Noise Exposure Forecast for the existing operations at Trumbull Airport. The contours were computed using 1971 data from Airport field logs and monthly airlines reports. The actual calculations were made with the assistance of the Airport Planning Office of the Connecticut Department of Transportation.

For purposes of clarity, only the 25, 30, and 35 NEF values are shown. The 40 NEF contour coincides with the runway, and if shown, would make it difficult to see either item clearly. For the same reason, the 35 NEF contour was not extended the full length of the cross runway. Due to their location within the Airport boundary, neither of these contours is critical to the evaluation of the noise impact on the community.

It can also be observed that the NEF contours extend in a straight line from the end of each runway. This assumes a straight approach to and departure from the runways. Personal observations indicate there are many planes which deviate from this route, but these tend to be small aircraft which do not

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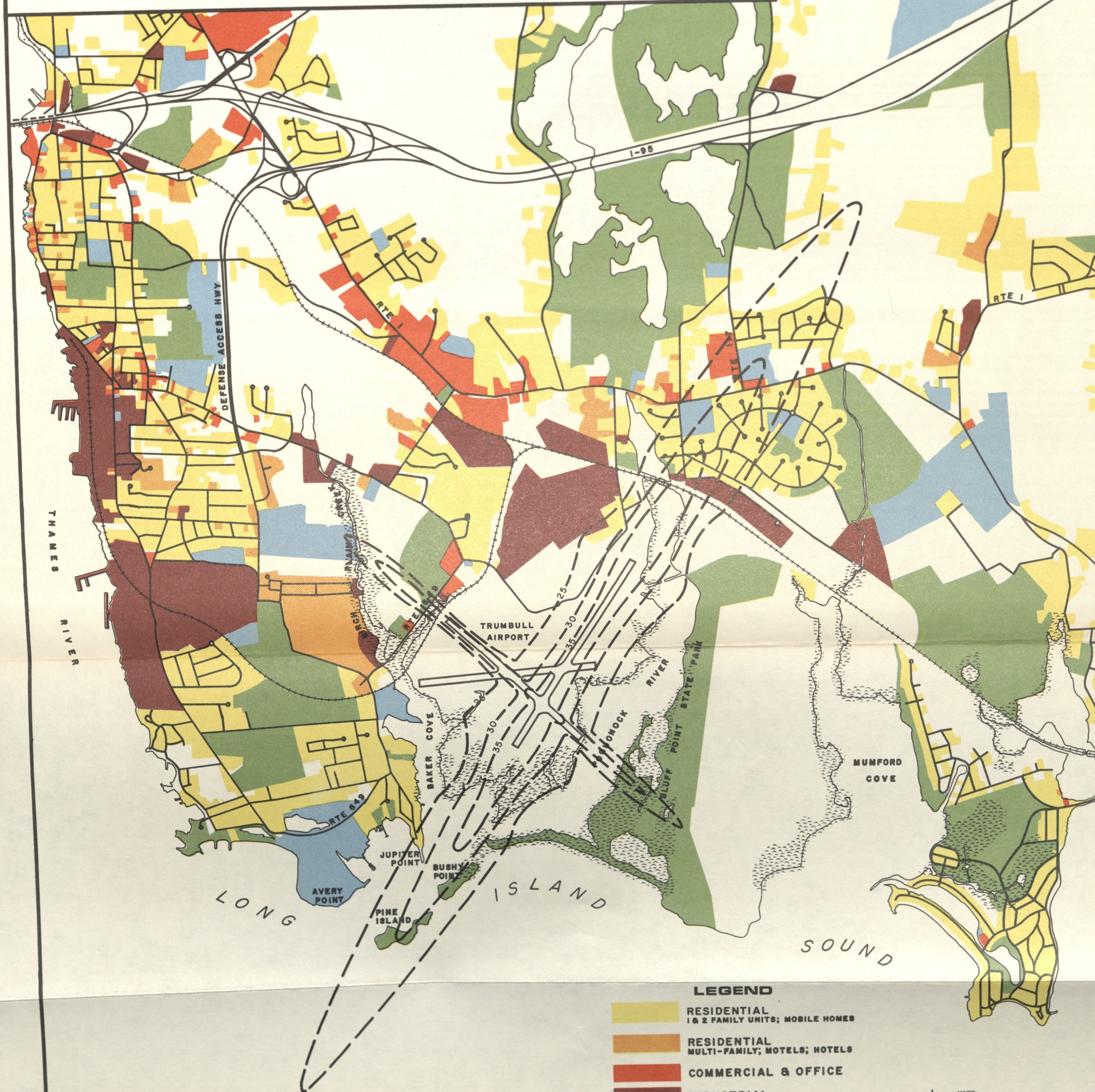
* Dickerson, David O., ed., Transportation Noise Pollution: Control and Abatement. NASA Langley Research Center and Old Dominion University, 1970, pp. 29-31.

** HUD Circular 1390.2, Noise Abatement and Control, August 4, 1971.

TRUMBULL AIRPORT
NOISE EXPOSURE FORECAST CONTOURS FOR 1971 OPERATIONS



LEGEND

- RESIDENTIAL — 1 & 2 FAMILY UNITS; MOBILE HOMES
- RESIDENTIAL — MULTI-FAMILY; MOTELS; HOTELS
- COMMERCIAL & OFFICE
- INDUSTRIAL
- INSTITUTIONAL
- RECREATION, OPEN SPACE, AND AGRICULTURE
- WETLANDS
- —oo— NOISE EXPOSURE FORECAST CONTOUR — NUMBER INDICATES LEVEL OF EXPOSURE

NOTE: LAND USE DATA AS OF 1971

NORTH

SCALE IN FEET: 0, 1000, 2000, 3000

SCRPA 1972

SEE CHAPTER IV FOR EXPLANATION OF NOISE EXPOSURE FORECASTS.

FIGURE 11

enter into the NEF computations. For the most part, the larger aircraft do follow a straight path for the distance covered by the NEF curves. Though on occasion planes may vary their approach or departure, it appears that a straight line is most representative of the overall situation.

In examining Figure 11, it is clear that the area most severely impacted by aircraft noise is the Poquonock Bridge neighborhood. Also affected, though to a much lesser extent, are Jupiter Point and two areas along Route 649.

Table 9 shows the area of land, outside the Airport boundary, broken down by land use categories, within each of the NEF contours. Comparing these areas with the guidelines presented in Table 8, it can be seen that there are 48 acres of residential and institutional development which do not meet the recommended limits. If the 25 NEF contour is assumed to be a preferable limit for residential development in Groton, then an additional 160 acres of existing developed land could be classified as being significantly affected by noise. This would then raise the total impacted residential and institutional acreage to 208.

More important than the acres of land affected by noise are the number of persons actually residing in the area. Using air photos and land use inventories, an estimate of the housing units within each contour was made. Using the 1970 average family size of 3.48 for Census Tract 7028 adjacent to the Airport, approximate populations were derived. The results are shown in Table 10.

Also lying within the 30 NEF contour are two public schools, Fitch Junior High School and Calude Chester Elementary School. As of November, 1971, Fitch had an enrollment of 776 and Claude Chester had 644, a total of 1,420 students. Telephone conversations with the school principals in December, 1971, indicated that in general the schools had adjusted to the noise. However, occasional planes do cause interruptions and can be disturbing. This is more apt to be true during warm weather when the windows are kept open.

The Town Hall and a town office building are within the 25 NEF contour. Approximately 80 persons are employed there. A wide variety of public transactions and services are carried out within these buildings.

In an attempt to evaluate the validity of the NEF contours and to determine the actual noise created by individual aircraft, the Naval Underwater Systems Center was requested to conduct a survey of aircraft noise in various locations around Trumbull Airport.* Readings were measured in decibels, using the "A" scale.

* The Naval Underwater Systems Center report is reproduced in its entirety in Appendix 3.

TABLE 9: LAND USES LYING WITHIN THE EXISTING NOISE EXPOSURE FORECAST CONTOURS, 1971*

Land Use Category	Approximate Area Within Specified Contours (in acres)			
	35 NEF	30-35 NEF	25-30 NEF	Total Within 25 NEF
Residential: 1 and 2-family and Institutional	5	43a	160	208
Residential: multi-family	-	1b	1	2
Commercial	-	-	8	8
Recreation: water-based	-	3	20	23
Industrial	2	2	7	11
Undeveloped	-	9	83	92

* This does not include the Airport site itself.

a Definite incompatibility with current level of Airport activity.

b. Possible incompatibility with current level of Airport activity.

TABLE 10: ESTIMATED HOUSING UNITS AND POPULATION LYING WITHIN THE EXISTING NOISE EXPOSURE FORECAST CONTOURS, 1971

NEF Values	Housing Units	Approximate Population
Within 35 NEF contour	23	80
Between 30-35 NEF contours	119	414
Between 25-30 NEF contours	302	1,050
Total within 25 NEF contour:	444	1,544

This is the scale that most accurately reflects the human ear. Table 7, presented earlier, relates several everyday activities to their sound level as measured in decibels, "A" scale - dB(A).

The aircraft most frequently measured in this survey were those used by the two commercial airlines operating out of Trumbull Airport, Pilgrim and Allegheny. Pilgrim Airlines uses the DeHavilland Twin Otter, while Allegheny uses the Convair 580. Both are turboprop aircraft, though the Convair 580 is considerably larger, carrying 50 passengers to Pilgrim's 20. Although jet aircraft do on occasion use Trumbull Airport, none were measured in the survey conducted by the U.S. Navy Underwater Systems Center.

The main areas for which noise measurements were requested were Jupiter Point, West Side Junior High School, Poquonock Bridge, and Fitch Senior High School.

The noise levels measured near West Side Junior High and at the top of Ft. Hill, both of which lie outside the NEF contours, ranged from 64 to 75 dB(A) depending on the size and location of the aircraft. The ambient (surrounding) noise level near the junior high school was 55 dB(A) and 60 to 70 dB(A) at the top of Ft. Hill. The report also notes that passing automobiles at the junior high registered a sound level of 75 dB(A). These factors tend to reduce the relative impact of the aircraft noise.

Readings taken at Jupiter Point, within the 25 NEF contour, ranged from 70 to 78 dB(A). Being a private residential area, with an ambient noise level of 41 dB(A), the aircraft noise creates a substantial impact on the neighborhood.

Noise measurements were made at several locations in the Poquonock Bridge area. The ambient noise level was 45 dB(A) throughout the neighborhood. Several readings were made south of Fitch Junior High School, which is within the 30 NEF contour. The values measured ranged from 70 to 84 dB(A), with the highest value being an Allegheny departure. Also measured here were passing cars, 65 to 70 dB(A), and passing trucks, 75 to 80 dB(A).

A single noise measurement was taken at the railroad trestle south of Fitch Junior High, within the 35 NEF contour. A sound level of 91 dB(A) was recorded as an Allegheny plane approached runway 23.

The survey of aircraft noise generally supports the problems indicated by the NEF contours. As readings were taken within the higher contours the values consistently rose. The few measurements that were made of automobile and truck traffic also underscored the fact that aircraft constitute only one of several potential sources of noise, all of which should be examined in planning community development.

V. FUTURE CONSIDERATIONS

FUTURE MARKET POTENTIAL

PASSENGER MARKET

The business and industry presently located in the Region generates a significant volume of passenger air travel which is currently being served by three airports, i.e., Trumbull, Bradley, and T.F. Green Airports. A survey of the major industrial concerns in the area indicated that on the average they expected 75% of their company-related travel to be by air in 1980. In addition to this business-related traffic, it would seem reasonable to assume that at least 75% of the tourist travel arranged by local travel agents will continue to be routed through these same three airports.

At the present time, as reported in Chapter II, a survey of local travel bureaus showed that 51% of their clients during a two-week period used Bradley, 7% used T.F. Green, and 15% used Trumbull. It can be reasoned that the current level of service at Trumbull had a decisive impact on these statistics. Therefore, if improved service is provided in the way of additional flights, more modern aircraft, and safer airport facilities at Trumbull, it can be assumed that more traffic will be routed directly out of this facility.

As a result of these factors, two conclusions can be made. First, there will be a significant demand for air travel generated in Southeastern Connecticut; and second, Trumbull Airport will be in competition with Bradley and Green Airports for a substantial amount of this demand. Thus, the future market potential for Trumbull will, in part, relate directly to the Airport's ability to improve its present level of service in order to attract a larger share of the market. At the same time, it must be recognized that improvements at Bradley and Green Airports will tend to increase their competitive advantages in relation to Trumbull.

Looking briefly at the future of improved methods of providing high-speed ground transportation (not only high-speed rail, but also electronically-controlled highways, air cushion vehicles, etc.), it seems highly unlikely that such modes will be competing for a share of local air traffic by 1980. In fact, current proposals being developed for high-speed rail transit in the Northeast Corridor would, significantly, bypass stops in Southeastern Connecticut. Therefore, a substantial void could exist in the transportation system for this area's future, and the need for an efficient connecting link to the Northeast Corridor's transportation system will exist. As such, Trumbull Airport and the existing rail lines adjacent to the Thames River could become integral elements in the future transportation network for Southeastern Connecticut.

However, it must also be recognized that the development of

improved transportation in the Northeast Corridor can possibly affect the market advantage of Bradley and Green Airports by reducing travel times to these two facilities. Improved ground transportation might also have the impact of reducing the need for air service between Boston and New York.

On the other hand, assuming for a moment that it is desirable to improve Trumbull Airport's market position so that this facility can become more competitive, what type of new services should be added? The industrial survey pointed out two specific types of services desired at Trumbull. One, that more flights be scheduled which would bypass the New York airports; and second, that service to the Midwest be provided (Chicago, Detroit, Cleveland, and St. Louis). Although these two types of services were requested most frequently, a desire was also expressed for flights to points in the South, such as Atlanta and Memphis, and for flights to upstate New York.

However, one must recognize that the Airport currently serves Southeastern Connecticut almost exclusively. Within this market area, origins and destinations are primarily in Groton. There is no reason to expect that this market area will change. Therefore, as explained later in this report, Trumbull's marketing potential will relate to additional population and economic expansion in the Region. Based on all current estimates, it seems unlikely that the Region will have an adequate passenger market to justify expanded direct nonstop service beyond the range presently being served. However, if airlines were to pick up passengers at both Trumbull and another small airport, such as Tweed-New Haven, an adequate market might be provided.

FREIGHT MARKET

Air was rated as a strong second to trucking in the general movement of freight according to the industrial survey conducted for this study. In addition, the estimates given for 1980 freight traffic in the survey showed that this trend would continue, with trucking estimated to handle 53% of total shipments, air 26%, rail 14% and shipping 6%. It should be noted that these percentages refer to shipments and not volume, for only 464 tons of cargo were handled at the Airport in 1970 (and of these 111 tons were mail), as compared with the approximately 1.5 million tons of cargo handled annually at the State Pier in New London.

Similar to the requests for additional passenger service, the survey of industries found a strong desire for service to the Midwest, with the Far-West and South also being requested. The major reason for desiring freight service at Trumbull was that it allowed for rapid response to customers' "crisis needs," a point mentioned by almost every concern interviewed.

There were, however, some significant drawbacks cited

regarding the present freight service through Trumbull, which if removed, would certainly attract more freight traffic to the Airport. Most significant of these drawbacks were the poor connections with major trunk lines and the present need for someone from the shipping company to meet Pilgrim flights in New York and physically transfer the shipment to another airline's flight since Pilgrim does not provide this service. It must be noted that although the improvement of interairline transfer and connections would be a major factor in attracting more freight traffic to Trumbull, in the long run, both the size and type of aircraft serving it and the frequency of service would have to change markedly for Trumbull to become a major freight terminal.

The probability of this happening is rather difficult to determine. Based upon the industrial firms currently located in the Region, whose raw materials and manufactured goods consist largely of bulk items, such a development seems unlikely. However, new technology may greatly change the freight market for the airplane both economically and quantitatively. In addition, continued heavy reliance on aircraft for mail shipment and delivery of perishable products plus the advent of new low bulk-oriented manufacturers to the area, might significantly increase the demands on Trumbull for freight service. But one can rather safely assume that such new demands will be proportionate to increased industrial growth in the Region. Therefore, the demand for the development of a major freight terminal seems unlikely.

Another subject which could have significant impact on Trumbull's future market area is the possible expansion of military use of the Airport for the Navy. During interviews with representatives of the Naval establishment at the Submarine Base, it was pointed out that most of the military transport flights serving the Submarine Base today operate out of Quonset, Rhode Island. However, with the completion of the current improvements to the Airport, such as the installation of a tower and an Instrument Landing System, these military transport flights could very well be rerouted to operate out of Trumbull Airport. Such a move would greatly reduce total travel time for shipments moving to and from the Submarine Base.

TRANSPORTATION FUNCTIONS TO BE MET

Section 13B-41 of the Connecticut General Statutes indicates that the Commissioner of Transportation may designate, design, establish, expand or modify a State airways system which will best serve the interest of the State within the limits of available appropriations. Section 13B-44 further declares that the State may establish, maintain and operate and may expand an airport in any location within the State, following the completion of a study of the adequacy of the existing airports, which study shall determine the necessity for the establishment of

additional airports or the expansion of existing airports. This section further states that the Commissioner of Transportation shall within one year after the completion of such study, formulate and adopt a Plan of Development which shall incorporate the findings of such study showing the necessity for such establishment or expansion in a manner consistent with the comprehensive long range master transportation plan of the State of Connecticut.

One must assume that the future role which Trumbull Airport is to play within the State of Connecticut is directly related to the total transportation system developed for the State by the Department of Transportation. Therefore, in identifying a function to be met by Trumbull Airport one must consider not only the area which is served, which we have defined as Southeastern Connecticut, but also the other transportation elements within Southeastern Connecticut that can provide compatible and alternative service for the Region's total transportation needs for both passengers and cargo.

Looking to the <u>1972 Connecticut Master Transportation Plan</u> prepared by the Connecticut Department of Transportation, one finds the following potential mission indicated for Trumbull Airport by 1990. Types of service to be provided include local service carrier, third level carrier, charter service and air taxi, base for corporate aircraft, and landing facility for military aircraft. Passenger service to be provided is anticipated to serve short-range distances (500 miles or less) and commuter needs. Unlike Bradley and Bridgeport Municipal Airports, containerized cargo is not anticipated to be served; however, Trumbull and Tweed-New Haven Airports are expected to provide additional air carrier cargo service for the State. Thus, the State expects Trumbull to serve both passenger and freight needs for Southeastern Connecticut and its immediate periphery.

Based upon the foregoing evaluation of the future market potential of the area, one can more clearly define the function which Trumbull is to meet in the future. Before doing so, however, one must determine the State's future plans for improved ground transportation which can most significantly affect Trumbull's future role in the Region's transportation system. Of particular interest is the State's delineating of the Northeast Corridor high-speed rail line along the current shore route from New Haven to Westerly, an apparent variation from National Department of Transportation thinking. If such a routing is continued and significant improvements are made to the railbed, some of Trumbull's services could be modified, in particular service to New York and Boston. However, this eventuality seems unlikely due to the great costs which would be required to upgrade the existing sinuous railbed between New Haven and Providence so as to accommodate truly high-speed rail transit. Therefore, as indicated previously, we must assume that before 1980 there will not be an adequate high-speed rail system along the shore route to compete with Trumbull for the commuting needs to Boston and New York.

One can also expect projected passenger service demands to be a function of future population growth in Southeastern Connecticut, for there is no indication that the current market area will change.

However, recognizing the size of the major industrial firms in the Region and the number of business trips which they currently generate, service at Trumbull will most likely be expanded and improved in the future. Based upon the recent merger of Allegheny and Mohawk Airlines and their subsequent intention to phase out their non-jet fleet,* one can assume that jet aircraft seem inevitable in Trumbull's future if Allegheny continues to provide passenger service to the area.

If the indications of the industrial survey conducted for this report are considered, one can anticipate future service being expanded to airports (in particular outside New York) such as Albany, Buffalo, Pittsburgh and Baltimore. However, there is not an existing market for direct flights beyond this range. Expansion of service to the Midwest and South, therefore, should only be expected to take place via intermediate cities such as Trumbull-New Haven-Cincinnati-St. Louis or Trumbull-Buffalo-Cleveland-Chicago. A southerly route could possibly take the course of Trumbull-New Haven-Atlanta. Routing such as this is a definite possibility for the future, especially when one considers the administrative procedures of the CAB, and the existence of major industrial-military establishments in Southeastern Connecticut. Therefore, it seems quite reasonable to expect Trumbull to meet the need for short-range transportation of passengers, with Bradley and Green continuing their functions of continental and international service and medium-range service respectively.

As far as cargo service is concerned, Trumbull should not be expected to serve much more than the "crisis needs" and perishable goods movement needs of local industries. However, as air cargo operations become more efficient and costs are reduced, additional increments of freight currently transferred by other modes of transportation might be diverted to airplane transport. In addition, as the Region's population grows, increased demand for mail service will result, based upon the current goals of the U.S. Postal Service, causing increased emphasis on air service. There is also the possibility that Trumbull will be looked to in the future as a base for military cargo operations in connection with the Submarine Base.

The last two functions of the Airport which warrant discussion are the proposed use of Trumbull as a base for corporate aircraft and continued use of Trumbull for general aviation (private planes). Currently, Pfizer, Inc., is the only business

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* Phone conversation with George King, Vice President, Public Affairs, Allegheny Airlines, April, 1972.

in the Region utilizing corporate aircraft on a regular basis. Unless new firms which utilize such private aircraft move to the Region, it seems unlikely that corporate aircraft facilities will play any significant role in Trumbull's future operation. However, of some interest is the possible expansion of military use of the Airport to serve possible consolidation of the State National Guard facilities in this Region.

Today approximately 43% of total estimated aircraft movements at Trumbull are in the general aviation class. In general, national trends indicate a large increase in the number of people flying private planes for both business and recreational purposes, and thus the need for increased facilities for general aviation is quite apparent. One of the most pressing problems of providing for general aviation use is current FAA policies which allow both private and commercial craft to use the same airports on a first-come-first-served basis. There is a crying need to segregate this type of traffic to assure safe and efficient use of airport facilities. In the case of Trumbull Airport, it is safe to assume that its role in the State system is to act as a diverter of commuter type traffic from heavily used Bradley. However, Trumbull's role in the Statewide airport system as related to general aviation is not so easy to define. It is directly related to future use by commercial carriers as well as future availability of existing facilities at Waterford Airport and new proposed facilities at Colchester and in the Preston-Griswold-Norwich area.

FUTURE ALTERNATIVE MODES OF TRANSPORTATION

For transportation from the Southeastern Region to other urban centers, the following future modes may be considered as transportation alternatives to help alleviate the increasingly crowded highways and airways of the Northeast Corridor.

HIGH-SPEED RAIL SERVICE

High-speed rail service between Boston and New York was advocated in a 1968 study of New England regional transportation needs by the New England Regional Commission because of the threatened congestion of roads and airspace.* Rail service between Tokyo and Osaka, Japan, and London and Manchester, England, was cited as evidence that rail service could tap part of the air market.** The Connecticut Department of Transportation (CONNDOT)

* New England Regional Commission. Regional Transportation Needs, November, 1968, pp. 7-8 and pp. 65-77.

** Experience with the automobile-carrying train service between Washington, D.C., and Florida adds support to this contention.

in a 1969 study of transportation recommended continuation and expansion of the Turboservice discussed in Chapter III.* (Presently there is weekday round trip Turboservice between New York and Boston once a day.) The U.S. Department of Transportation in its study of the Northeast Corridor recognized underutilization of current rail capacity and recommended improved high-speed rail service during the 1970's building on the Metroliner-Turboservice experience with more cars, better passenger amenities, more frequent service, and the availability of non-reservation and nonstop service. It further recommended upgrading rights-of-way so that travel times to Washington and Boston from New York City could be reduced to 2:00 and 2:45 respectively, versus current times of 2:30 and 3:30.** CONNDOT also concurred with this study by recommending continuation of the Turboservice in its 1972 transportation plan.***

If high-speed rail service is to be effective, its downtown to downtown times must meet or exceed those of air travel. Presently the Metroliner nonstop time approaches the best nonstop overall flight time, assuming no delays, from New York to Washington. For service from New York to Boston, the Turboservice is about one hour slower than the overall time by air.

Another consideration of high-speed rail service is whether or not such service would have scheduled stops in Southeastern Connecticut. The Northeast Corridor Study indicated that New London would not be included among its station stops.+ This would effectively remove Southeastern Connecticut from high-speed rail service.

In fairness, we must note that high-speed rail transportation is also a significant source of noise and vibration. Depending on its right-of-way, a high-speed rail line may prove more annoying than an airport.++

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* CONNDOT. Transportation 2020 in Connecticut, September, 1969, pp. 89-102.

** U.S. Department of Transportation. Recommendations for Northeast Corridor Transportation, Vol. 1, September, 1971, pp. 3-10.

*** CONNDOT. Connecticut Master Transportation Plan, op. cit., p. 49.

\+ U.S. Department of Transportation. Recommendations for Northeast Corridor Transportation, Vol. 2, September, 1971, pp. 5A-6.

++ Dickerson, David O., ed., op. cit., 1970, pp. 34-36 and 74-75.

CONCLUSIONS: If Congressional support is forthcoming, high-speed rail service appears to be a reasonable transportation alternative by the late 1970's since the right-of-way is in existence and the technology is at hand for improving service. With right-of-way improvements such as the elimination of grade crossings, straightening of curves, and the use of welded rails, overall speeds could be increased. The Northeast Corridor study indicated that most likely private enterprise would not entirely finance improved high-speed rail service, but since the project is expected to be profitable, it recommended Federal direct loans or guaranteed bonds as an incentive for private investment.*

In order to achieve high-speed rail service, the residents and public officials of Southeastern Connecticut will have to seek it more actively than they have in the past. This becomes especially decisive concerning the question of whether or not high-speed trains will stop in Southeastern Connecticut.

AIR CUSHION VEHICLE SERVICE

A possible future alternative for high-speed transportation in the Northeast Corridor is the air cushion vehicle which operates on a cushion of pressurized air that is forced into enclosed space beneath the vehicle. The vehicle can be operated over both land and water. CONNDOT recommended its use on Long Island Sound to replace ferry service and as a possible alternative to lessen the need for a Long Island to Connecticut bridge.** This service would require no expense for a right-of-way and a minimum of terminal facilities. Currently these hovercraft are crossing the English Channel with capacities of up to 250 passengers. The U.S. Department of Transportation in its Northeast Corridor Study recommended that research on a land tracked air cushion vehicle be expanded so that decisions could be made in the latter part of the 1970's on the feasibility of such a system for the 1980's in the Northeast Corridor.***

V/STOL SERVICE

Two types of aircraft that may alter commercial aviation in the future are short-take-off-and-landing (STOL) aircraft, which require shorter runways than today's long runways for jet aircraft (Figure 12), and vertical-take-off-and-landing (VTOL) aircraft, which require no runway.

The New England Regional Commission indicated in its 1968

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* U.S. Department of Transportation, op. cit., Vol. 1, p. 4.

** CONNDOT, op. cit., p. 93.

*** U.S. Department of Transportation, op. cit., Vol. 1, p. 48.

AIRCRAFT RUNWAY LENGTH REQUIREMENTS

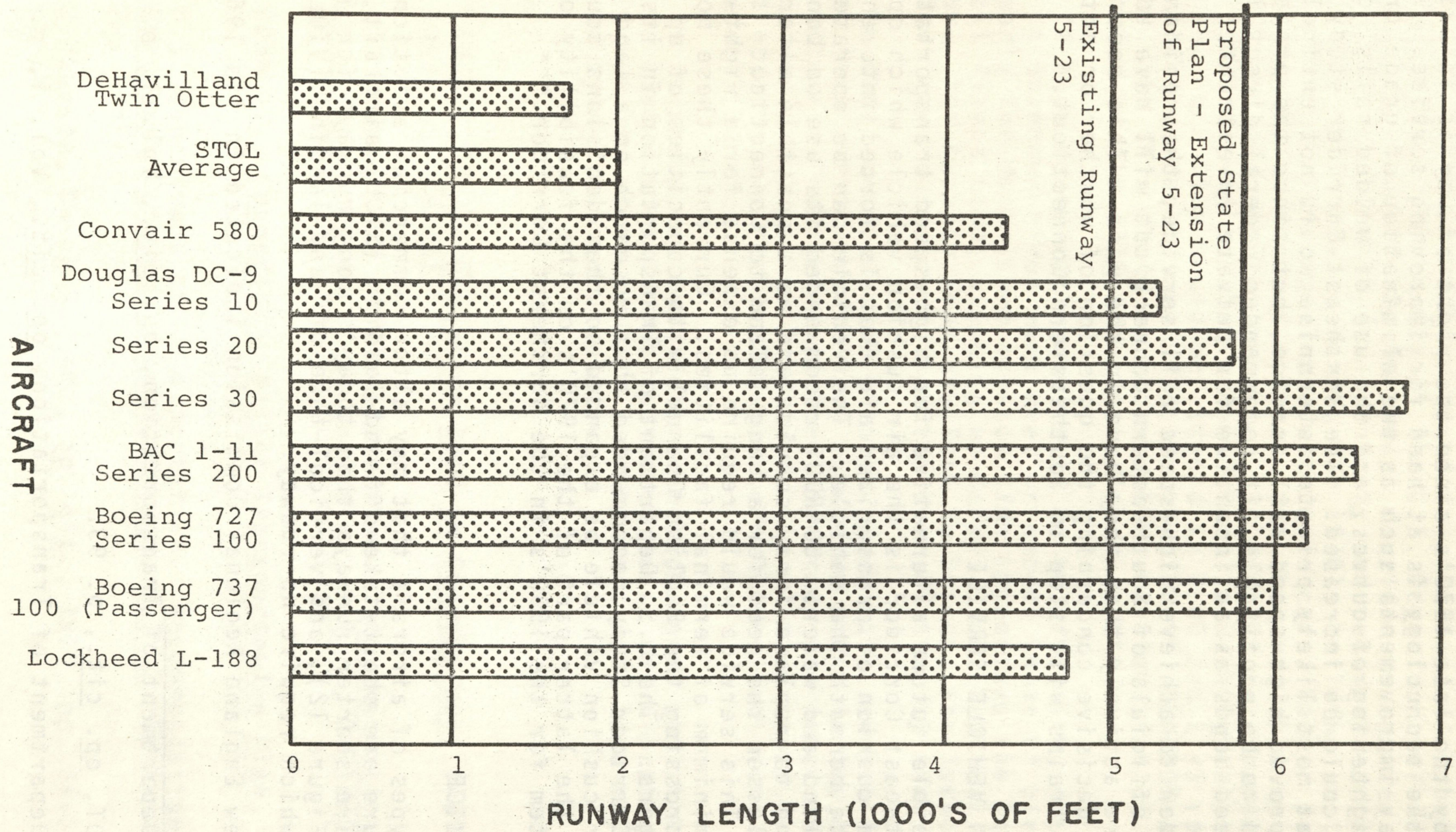

FIGURE 12

SOURCE: Janes All World Aircraft Almanac 1968-69, and Kaiser Engineers Aircraft Requirements. Lengths shown are the maximum needed for a fully loaded takeoff. The STOL figure is an average of the STOL references cited in Chapter V. Although the Twin Otter can operate on shorter runways, the figure presented is based on the experience of Pilgrim Airlines.

study that the cost of V/STOL was too great and their capacity too limited, but noted that this could change.* CONNDOT in a 1969 study noted existing research aircraft such as the Hummingbird and Breguet and made provision for V/STOL airports in its plans.** The Regional Plan Association also noted the testing of the Breguet and indicated that problems such as a bumpier ride than conventional aircraft, the need for STOL ports closer to the urban populations they will serve, and a separate airspace control system would have to be solved to obtain full advantage of the STOL. The study did indicate, however, that by the end of the 1970's the current plane movements within the Northeast Corridor may be the domain of V/STOL.*** The Federal Aviation Administration in a 1970 publication indicated that the current drawback in the large-scale use of STOL is the lack of a high-capacity and economically competitive aircraft as well as lack of port facilities. It did estimate the STOL aircraft in the 50-150 passenger size would be manufactured in the mid-1970's.+ The Northeast Corridor Study by the Federal Department of Transportation recommended research and development on V/STOL aircraft concerning airport and air traffic control systems, safety, noise, and air pollution, and passenger ride quality so that these data would be at hand in the latter 1970's for investment decisions for the 1980's.++

In 1972 the National Aeronautics and Space Administration (NASA) awarded contracts for the design of research STOL aircraft which it hopes to have airborne by 1975. Research data from the test flights should be available for military and civilian use within 8 years.+++ Kurt Holenemser, writing in the December, 1971, issue of *Environment*, notes that although many engineering concepts have been tested in experimental aircraft, more research is needed before the V/STOL craft enter commercial service. Lower cruising speeds, shorter range without refueling, bumpy rides, more sensitivity to wind at lower altitudes, noise and air pollution, and safety hazards are the types of problems that must be resolved before these planes can be used effectively. Holenemser does feel, however, that V/STOL aircraft will be effective in high density corridors (such as the

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* New England Regional Commission, op. cit., p. 8.

** CONNDOT. 2020, op. cit., pp. 63-64, pp. 91-93, p. 100.

*** Regional Plan Association. The Region's Airports a Policy on Air Travel for the New York Region, July, 1969, p. 15.

\+ Federal Aviation Administration. Planning the Metropolitan Airport System, May, 1970, p. 49.

++ U.S. Department of Transportation, op. cit., Vol. 1, pp. 1-4.

+++ Kurt Holenemser. "Aircraft in the Balance," Environment, December, 1971, p. 42.

Northeast) with their frequent ground and air traffic jams, and that in the 1980's they may provide overall faster and more economic service than that given by present planes.* CONNDOT continued to acknowledge V/STOL with provision in its 1972 Master Transportation Plan for V/STOL ports near major centers of population, although Trumbull is not classified as one of these ports.**

CONCLUSIONS: Although much experimental work has been done on V/STOL aircraft, more research must be completed before these planes can fully assume the short-haul market in the Northeast Corridor presently held by turboprops and medium-range jets. Most indications are that by the latter part of the 1970's and the early 1980's, V/STOL aircraft with a 50-passenger capacity should be commercially feasible.

EVALUATION OF PREVIOUS FORECASTS FOR TRUMBULL AIRPORT

INTRODUCTION

Plans for transportation facility expansion are nearly always based on projections or forecasts of demand and use. Currently existing plans for the future development of Trumbull Airport follow this pattern. Steeply rising curves depicting expected passenger growth have been used as one justification for proposing major State and Federal expenditures at Trumbull. These projections must be evaluated before the Airport improvement program proposed by the Connecticut Department of Transportation can be assessed.

Forecasting future conditions is a difficult art, and forecasting transportation system usage is particularly chancy and subject to error because of the many variables that can alter assumed future conditions. Major factors that will affect the future traffic volumes at Trumbull Airport include: the population growth in the Airport's market area, the economic activities within the market area, the health of the nation's and the Region's economy at any given point in the future, the level of service provided by the Airport, competition from other nearby airports, and competition from other modes of transportation. Obviously, the uncertainty of predicting the effect of these variables increases geometrically as one looks farther into the future. The point of this discussion is that, regardless of how sophisticated the projecting methodology is, forecasts of Trumbull Airport use are at best educated guesses.

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* Ibid., p. 44.

** CONNDOT. Master Transportation Plan, p. 60.

TRUMBULL AIRPORT MARKET AREA

One of the first points to be established in attempting to estimate the Airport's activity level is the present and probable future area from which it will draw passengers. The population and economic growth within this market area then provide a basis for calculating potential Airport users.

Currently Trumbull Airport serves little more than the Southeastern Connecticut Planning Region. Results from the origin and destination survey of scheduled airline and air taxi passengers enplaning and deplaning at Trumbull conducted as part of this study showed that 94% of the outbound passengers resided in Southeastern Connecticut and that 93% of the inbound passengers had final destinations within Southeastern Connecticut. Is this area of traffic generation likely to change markedly over the next 20 years? It seems doubtful that it will. This conclusion is reached chiefly because of the comparatively close proximity of three other airports, two of which now provide and can be expected to continue to provide a higher level of service than does Trumbull.

The chances of Trumbull capturing any significant volumes of passengers or cargo from either the Capitol Region, served by Bradley International Airport in Windsor Locks, or the Providene area, served by Green Airport in Warwick, Rhode Island, seem highly remote. The more extensive service provided by Bradley and Green plus the approximately 45-mile trip from the center of the Hartford and Providence population concentrations to Trumbull place Trumbull at a distinct disadvantage in the competition for air passengers and cargo. In fact, it seems likely that both Bradley and Green may increase their ability to attract passengers from the fringes of the area now served by Trumbull.

To the west, Trumbull Airport's market area is limited by the influence of Tweed-New Haven Airport, which provides essentially the same type of service as Trumbull. At approximately the Connecticut River it becomes quicker to drive to Tweed-New Haven Airport than to Trumbull.

Northeastern Connecticut, which has no airport with scheduled service within it, is served by Bradley, Green, Worcester Municipal Airport in Massachusetts, and Trumbull. Which of these airports would be used by a Northeastern Connecticut resident depends on which one is closest to where he lives and on where he wishes to go. The origin and destination study at Trumbull indicates that it currently is attracting few residents of Northeastern Connecticut.

We conclude that over at least the next 20 years Trumbull Airport's market area is likely to be confined to the Southeastern Connecticut Planning Region. This means that the passenger and cargo activity of the Airport will be limited by the amount of population and economic growth within this Region. The

absolute limit imposed by the Region's size will exist even if the per capita rate of Airport usage increases during the next two decades.

EVALUATION OF PREVIOUS COMMERCIAL PASSENGER FORECASTS

Forecasts of commercial passenger enplanements, i.e., passengers boarding outbound scheduled airline and air taxi flights, are presented in the Airport Facilities Plan for the State of Connecticut prepared by Frederic R. Harris Associates of Stamford, Connecticut, and published in 1969. For the period 1970-90 this study projected the following levels of commercial passenger enplanements at Trumbull Airport:

1970 - 80,000
1975 - 130,000
1980 - 249,000
1985 - 427,910
1990 - 614,100.*

Actual enplanements in 1970, one year after the completion of the study, were 47,120, 41% less than the short-range forecast made by Harris.**

In developing a forecast of needs at Trumbull Airport through 1990 for inclusion in the National Transportation Planning Study conducted in 1971, the Connecticut Department of Transportation (CONNDOT) used the Harris projections as a base for forecasting commercial passenger enplanements and cargo volumes.*** However, the State planners adjusted the Harris passenger projections downward in recognition of the wide disparity between Harris' 1970 passenger forecast and actual volumes. In the words of CONNDOT: "Because of the slump in National and State economics in 1970, it was felt that 1969 enplanements represented a more accurate base from which to forecast enplanements. Using the 1969 enplanements and applying a reduction to the Harris forecasts by direct proportioning the revised enplanement forecasts for Trumbull Airport were determined to be:

1975 - 91,000
1980 - 175,000
1985 - 300,000
1990 - 430,000."+

* Frederic R. Harris Associates. Airport Facilities Plan for the State of Connecticut, 1969, p. 83.

** State Bureau of Aeronautics. Monthly Statistical Reports of Airport Activities, 1967-71.

*** Memo provided by George Sherwood, Airport Planner, CONNDOT, August, 1971.

\+ Ibid.

With respect to the CONNDOT revisions it is important to note that these represent only a proportional statistical adjustment based on the relative difference between the actual 1969 volumes at Trumbull and the Harris forecast for 1970. The revision is not based on a comprehensive re-examination of the Harris forecast nor is it based on an evaluation of future conditions within the Airport's market area, Southeastern Connecticut, which will strongly influence passenger volumes.

It is the contention of this present report that Airport activity will be related to the growth of population in Southeastern Connecticut, which in turn reflects long-term economic growth. We believe that the very rapid rate of growth in commercial passenger volumes at Trumbull from 1960-70 was due to the evolution of service from a low state of development in 1960 to a condition approaching maturity for a small commercial airport in 1970. Passenger volumes will undoubtedly grow, but we believe they will rise at substantially lower rates than was true over the 1960-70 decade and be related much more closely to population and economic growth.

Historically, Southeastern Connecticut's population growth has been at a moderate pace. In the 1940-50 decade the area grew by 15.5%. From 1950-60 the rate jumped to 27.7%. And between 1960-70 our population increase amounted to 22.9%. In the 1960-70 period the Region's total non-agricultural employment increased at a rate of 26.3%, slightly faster than the pace of population growth.

Short of a major new economic development in the Region or adjacent to it, the next 20 years should not see an unusually sharp rise in the population growth rate. Even the creation of a new town of the size proposed for Colchester (25,000)* during this period if added to normal growth would produce only a moderate rise in the Region's rate of population growth between 1970-90.**

SCRPA has recently revised its long-range population projections for the region after analyzing the results of the 1970 Census.*** These revisions do not include the possibility that a new town of 25,000 inhabitants will be developed in Colchester. We forecast that Southeastern Connecticut will experience a population increase of 25% between 1970-80, giving a total regional

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* Norwich Bulletin. "Developers Explain Plans for New Planned Community in Colchester," March 23, 1972.

** It should also be noted that residents of a new town in Colchester would live in the northwestern segment of the Region where it is quicker to fly from Bradley International Airport than from Trumbull.

*** SCRPA. Population and Development - 1970, 1972, pp. 17-20.

population of 275,000 in the latter year. The decade of the '80s is forecast to have a population growth rate of slightly more than 28%, producing a population of 353,000 in 1990. Should the new town of 25,000 develop during these two decades, the 1970-90 regional population growth rate would rise from the 60% expected under "normal" conditions to 72%.

Table 11 below compares several projections relating to Trúmbull Airport.

TABLE 11: TRUMBULL AIRPORT PROJECTIONS COMPARISON

Item	Actual 1970	1980 Forecast Absolute	1980 Forecast 1970-80 % Increase	1990 Forecast Absolute	1990 Forecast 1980-90 % Increase
Regional Population	220,096	275,000	25.0	353,000	28.4
Trumbull Commercial Passenger Enplanements, Harris Study	47,120	250,000	431.9	614,000	145.6
Trumbull Commercial Passenger Enplanements, CONNDOT	47,120	175,000	272.3	430,000	145.7

Sources: SCRPA; Harris Study; CONNDOT.

To state the obvious, both the Harris passenger enplanement projections and the revised forecasts of CONNDOT show no valid relationship to expected population growth in the Trumbull Airport market area. The more conservative CONNDOT projection foresees commercial passenger enplanement growth at Trumbull increasing at more than 10 times the expected rate of the Region's population growth between 1970 and 1980. In the 1980-90 period the rate of growth in enplanements is predicted by CONNDOT to be more than 5 times that expected for the area's population.

This magnitude of difference seems unlikely unless at least one of two things occurs: (1) the Trumbull Airport market area increases substantially beyond Southeastern Connecticut or (2) the rate of Airport usage by Southeastern Connecticut residents increases very sharply. We have already demonstrated that an expansion of Trumbull's market area does not appear probable

during the 1970-90 period, leaving only the question of the rate of Airport usage to be considered.

In 1970 there were 214 commercial passenger enplanements at Trumbull Airport for every 1,000 residents in Southeastern Connecticut. (The enplanement rate has hovered at or near this figure throughout the 1967-71 period.) This compares with a rate of 343 per 1,000 residents for the State as a whole.* For the CONNDOT forecast for 1980 to be met without an increase in market area, the rate of commercial passenger enplanements at Trumbull would have to rise to 636 per 1,000 residents. By 1990 the CONNDOT forecast could be met only by a rate of 1,218 enplanements per 1,000 population. Such increases are clearly out of the realm of likelihood, even if we discount the possibility that alternative modes of high-speed ground transportation will be available by 1990.

The future usage rate at Trumbull is impossible to predict with certainty. However, we do know a number of factors that will affect it. The principal factors which would tend to increase the rate of airport usage include: (1) Expanded service, i.e., a shift from a short-haul (500-mile-range service) to a medium-range (1,000-mile-range service) facility. (2) Improved facilities at the Airport, especially safety facilities, which could serve to increase public confidence in flying to or from Trumbull. (3) Increased acceptance by the public and business of flying as a means of travel. Factors which would tend to dampen the rate of airport usage include: (1) Continuation of Trumbull's function as a short-haul airport. (2) Sharp competition from other nearby airports, specifically Bradley and Green. (3) Competition from high-speed ground transportation.

Of these factors it seems probable that safety facilities at the Airport will improve and that public acceptance of air travel will continue to grow. For purposes of this study, we have assumed that Trumbull will provide only short-range service (out to 500 miles) through 1990.** We can expect Bradley and Green Airports to draw some passengers, particularly those on

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* Based on 1,039,111 commercial passenger enplanements at all airports in Connecticut (data supplied by CONNDOT) and a 1970 State population of 3,039,709 (1970 Census). Note that this rate does not take into account Connecticut residents using out-of-State airports and that it includes residents of other states using Connecticut airports.

** A memo on the adopted mission for Trumbull Airport provided by George L. Sherwood, Airport Planner, CONNDOT, on 9 August 1971 states that one mission of the Airport is to: "Accommodate domestic short-range air carrier service for Southeastern Connecticut." However, for purposes of impact analysis, a CONNDOT projection with assumed medium-range service is presented later in this report.

longer trips, from Southeastern Connecticut. However, we have not assumed that a major new jetport will be built in Eastern Connecticut. It seems likely that by at least the decade of the '80s effective high-speed ground transportation will be a reality in the Boston-Washington corridor.

There is, in our judgment, no single factor which looms on the horizon as a catalyst to spur a very rapid increase in commercial passenger enplanements from Trumbull Airport. But there are several factors which point to moderate increases in usage of the Airport.

Experience at nearby Green Airport in Warwick, Rhode Island, is useful in providing a concrete comparison for judging Trumbull's future potential. Green, which provides medium-range service, now has a market area population approaching one million people, roughly four times Southeastern Connecticut's population in 1970 and about three times the Region's expected 1990 population. Part of this market area, it should be noted, extends into Massachusetts and Connecticut. Commercial passenger enplanements at Green are now on the order of 400,000 per year, about 8.5 times those at Trumbull. Green's rate of commercial passenger enplanements is in the range of 400-425 per 1,000 population, or about twice that of Trumbull Airport.*

Given the constraints noted earlier, we believe that Trumbull Airport has a reasonable prospect of achieving a rate of 250 commercial passenger enplanements for every 1,000 persons in the Region's population by 1980. This would result in 68,750 enplanements in that year. To achieve this, commercial passenger enplanements would have to increase by 46% during the decade of the '70s, or nearly twice as fast as the Region's expected population growth rate. Total commercial passenger enplanements of 68,750 in 1980 would be 106,250 less than the current CONNDOT forecast for that year.

By 1990, we believe Trumbull Airport could experience a rate of 300 commercial passengers per 1,000 persons in the Region. This compares with a 1970 Statewide enplanement rate of 343 per 1,000. At a rate of 300 enplanements per 1,000 population, Trumbull Airport in 1990 would be handling 106,000 departing commercial passengers. This would be a 54% increase in passengers between 1980 and 1990, contrasted with an expected 28% increase in the Region's population during this period. A total of 106,000 commercial passenger enplanements at Trumbull Airport in 1990 would be 324,000 less than the forecast of CONNDOT noted earlier in this report.

At present about half of the total commercial passengers

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* These calculations are based on data presented in Technical Paper Number 14 and Technical Paper Number 16, Rhode Island Statewide Planning Program, 1969 and 1970.

using Trumbull Airport are enplanements.* We have assumed that this relationship will continue through 1990 in developing the following estimate of total commercial passengers for impact analysis.

TABLE 12: SCRPA/GPO FORECAST OF COMMERCIAL PASSENGERS AT TRUMBULL AIRPORT

	Enplanements	Total
1970: (Actual)	47,120	93,679
1980	68,750	137,500
1990:	106,000	212,000

EVALUATION OF PREVIOUS CARGO FORECASTS

Future air cargo volumes are even more difficult to anticipate than passenger volumes. In addition to the factors affecting passenger trends, air cargo volumes are influenced by the nature of industrial activities in the Region and by the cargo facilities available at Trumbull.

The Harris Study projected the following volumes of air cargo being handled at Trumbull:

1970:	400 tons
1980:	3,000 tons
1990:	11,000 tons**

Actual air cargo tonnage in 1970 was 464 (including 111 tons of mail).*** In its work for the National Transportation Planning Study, CONNDOT used without modification the Harris cargo volume projections.+ When related to the Region's population, these projections produce the following rates: 1970 (actual), 2.1 tons of cargo per 1,000 population; 1980, 10.9 tons of cargo per 1,000 population; 1990, 31.1 tons of cargo per 1,000 population.

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* State Bureau of Aeronautics, monthly activity reports, op. cit.

** Harris, op. cit., p. 89.

*** State Bureau of Aeronautics, monthly activity reports, op. cit.

\+ George B. Sherwood memo, op. cit.

Whether these rates can actually be achieved will depend in large part on the type of industrial base Southeastern Connecticut has in the future. The current industry clearly does not produce a major cargo impact on Trumbull. However, the survey of major industries and institutions conducted as part of this study showed that air service is considered to be second in importance only to truck service in moving freight. (This ranking does not reflect actual tonnages moved. For example, far more industrial materials and products move by rail than by air.) Several firms indicated a desire for expanded freight service through Trumbull.

We have concluded that the industrial base of Southeastern Connecticut is not likely to shift substantially in the 1970-80 period to the high value, light weight or perishable products which are especially suited to air freight. Unless such a shift occurs, the nearly 8-fold increase in cargo tonnages predicted by Harris seems to be on the optimistic side. There were, for example, no dramatic changes in freight tonnage at Trumbull throughout the 1967-71 period.* Rather than an increase of more than 750%, as projected by Harris, a growth rate on the order of 200% appears to be more reasonable for the 1970-80 decade. This gives an estimated 1980 cargo tonnage of slightly less than 1,400.

The 1980-90 period is even more uncertain than the preceding decade. There is more likelihood of significant shifts in the Region's industrial base. There is also greater likelihood of improved technology for shipping cargo by air. Based on these two points, there appears to be some justification for anticipating a more rapid growth of air cargo handled at Trumbull during the second decade of our study period. For purposes of analysis, we have assumed a 500% increase in cargo tonnage for 1980-90. This results in an estimate of 8,400 tons of air cargo in 1990, or 2,600 tons less than Harris' projection.

EVALUATION OF PREVIOUS GENERAL AVIATION FORECASTS

General aviation includes all civilian flying except commercial air carriers. Unfortunately, data on general aviation activities at Trumbull Airport are very unreliable, as noted in an earlier section of this report. In the absence of a control tower at the Airport two sets of estimates of general aviation movements are made. Those of the Federal Aviation Administration are based on semi-annual four-day surveys and a projection from national trends. Those of the State Bureau of Aeronautics are based on incomplete data compiled by the Airport Manager. The FAA estimates that in 1970 the Airport had nearly 46,000 general aviation movements,** while the CONNDOT estimate for the

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* State Bureau of Aeronautics, monthly activity reports, op. cit.

** Letter from Robert A. McEwing, Chief, Planning Branch, New England Region, Federal Aviation Administration, 1 March 1972.

same year is only slightly more than 13,000.*

CONNDOT has recognized that its inventory of general aviation activity is probably low because all operations are not logged and has adjusted it upward by 50%.** This adjustment is arbitrary, but we have accepted it for purposes of this study. With the 50% increase, the assumed total general aviation operations for 1970 become 19,500.

The Harris Study forecast a total of 90,000 general aviation movements at Trumbull in 1980 and 128,250 in 1990.*** However, these rpojections were based on the higher FAA estimates of current use by general aviation aircraft, which at the time of the Harris Study were reported as 41,700.

While the true current general aviation volumes are in considerable doubt, some estimate of future volumes is necessary for calculations later in this report of the probable impact of Trumbull Airport under different conditions. We have, therefore, assumed the following: (1) The general aviation airport in the Norwich/Preston area proposed by the State will not be built by 1990. (2) Waterford Airport will continue to function as a general aviation field through 1990. (3) General aviation movements at Trumbull Airport will increase by 100% from 1970-80 to reach a total of 39,000. (4) Between 1980-90 general aviation movements will increase by 66% to a total of 64,740.

EVALUATION OF PREVIOUS MILITARY AIRCRAFT FORECASTS

Military operations at Trumbull Airport are estimated by CONNDOT to have totalled 8,724 movements in 1970.+ As was the case with general aviation data, the figures on military activities are subject to question since they are not based on a complete log of operations. Nearly 90% of the military movements are estimated to be by locally based aircraft. This high percentage is due to the National Guard helicopter repair operation at Trumbull.

The Harris Study forecast that in 1970 Trumbull would handle 5,054 military aircraft movements, and this figure was held con-

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* State Bureau of Aeronautics, monthly activity reports, op. cit.

** Memo provided by George Sherwood, Airport Planner, CONNDOT, January, 1972.

*** Harris, op. cit., p. 148.

\+ State Bureau of Aeronautics, monthly activity reports, op. cit.

stant through the close of this century.* Harris' estimate was low due to an unanticipated expansion in the National Guard aircraft repair operation, which increased military movements sharply from 1967-68. Since 1968, there has been only slight fluctuation in the total military aircraft movements.** We have assumed that military movements will remain at about the current level through 1990. For ease of computation, this has been rounded off to 9,000 movements in 1980 and 1990.

ANALYSIS MODELS TO EVALUATE FUTURE IMPACT

As we have said earlier, forecasts are at best educated guesses. But they remain the only way of estimating how the Airport may affect the Town in the years ahead. Rather than making such an evaluation of one projection of future conditions, we have chosen to pose four different sets of assumptions, or models, for impact analysis. The analysis models are presented in this section of the report, although the evaluation of their impact is in Chapter VI.

Three of the models, A, B, and C, shown on pages 90, 91, and 92, use the SCRPA estimates for 1990 presented earlier in this chapter. These basic assumptions are: (1) Trumbull will have a total 212,000 commercial passengers. (2) A total of 8,400 tons of air cargo will move through the Airport. (3) There will be 64,740 general aviation aircraft movements in that year. (4) There will be 9,000 military aircraft movements.

Model A assumes that there will be no runway extension and that the types of commercial aircraft will be confined to either piston engine or turbo-prop. Model B also assumes no runway extension but presumes a shift to Short Take-off and Landing (STOL) aircraft for scheduled air carriers. Model C assumes an extension of Trumbull's main runway as proposed by CONNDOT and the institution of short-range (up to 500 miles) commercial service via DC 9-10 90-passenger jet aircraft.

The last model, D, is based on CONNDOT's projection that commercial passengers at Trumbull will total 860,000 by 1990. Cargo tonnage is also assumed to be the 11,000 tons forecast by the Harris Study. General aviation and military aircraft movements are held to the levels assumed for Models A, B, and C. A runway extension, as proposed by the State, is presumed to have occurred, and commercial service via DC 9-10 aircraft is assumed to be available out to a 1,000-mile radius.

These models are not proposals. They are presented merely

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* Harris, op. cit., pp. 147 and 148.

** State Bureau of Aeronautics, monthly activity reports, op. cit.

for analysis purposes to demonstrate the likely effect of Trumbull Airport under different roles and with different operational volumes. The impact analysis using these models is presented in Chapter VI beginning on page 95.

One final comment, we believe that whatever functional mission is finally defined for Trumbull Airport in the future should be based not on projected volumes but on community and regional desires.

TABLE 13: 1990 ANALYSIS, MODEL A

		Annual Passengers	Annual Aircraft Movements
1.	Total Commercial passengers.	212,000	
2.	Air taxi passengers (40% of total.)*	84,800	
3.	Total air taxi aircraft movements. (Based on 20-seat aircraft with 50% load factor.)**		8,480
4.	Short-range certified air carrier passengers. (60% of total.)	127,200	
5.	Total short-range certified air carrier aircraft movements. (Based on 50-seat turbo-prop aircraft with 50% load factor.)***		5,088
6.	Total all-cargo aircraft movements. (Based on 6 movements/week.)		312
7.	Total general aviation aircraft movements.		64,740
8.	Total military aircraft movements.		9,000
9.	Total aircraft movements of all types.		87,620

* From 1967-71 the air taxi service at Trumbull Airport carried between 38% and 44% of the total commercial passengers each year. Source: State Bureau of Aeronautics, monthly activity reports, op. cit.

** In 1971 Pilgrim Airlines had an average of 8.9 passengers for each movement of its 20-seat aircraft. Source: Ibid.

*** In 1971 Allegheny Airlines had an average of 14.1 passengers for each movement of its 50-seat aircraft. Source: Ibid.

TABLE 14: 1990 ANALYSIS, MODEL B

	Annual Passengers	Annual Aircraft Movements
1. Total commercial passengers.	212,000	
2. Air taxi passengers. (40% of total.)	84,800	
3. Total air taxi aircraft movements. (Based on 20-seat aircraft with 50% load factor.)		8,480
4. Short-range certified air carrier passengers. (60% of total.)	127,200	
5. Total short-range certified air carrier aircraft movements. (Based on 40-seat STOL aircraft with 50% load factor.)		6,360
6. Total all-cargo aircraft movements. (Based on 12 movements/week in STOL aircraft.)		624
7. Total general aviation aircraft movements.		64,740
8. Total military aircraft movements.		9,000
9. Total aircraft movements of all types.		89,204

TABLE 15: 1990 ANALYSIS, MODEL C

		Annual Passengers	Annual Aircraft Movements
1.	Total commercial passengers.	212,000	
2.	Air taxi passengers (30% of total.)*	63,600	
3.	Total air taxi aircraft movements. (Based on 20-seat aircraft with 50% load factor.)		6,360
4.	Short-range certified air carrier passengers. (70% of total.)	148,400	
5.	Total short-range certified air carrier aircraft movements. (Based on 90-seat DC 9-10 with 30% load factor.)		5,496
6.	Total all-cargo aircraft movements. (Based on 6 movements/week.)		312
7.	Total general aviation aircraft movements.		64,740
8.	Total military aircraft movements.		9,000
9.	Total aircraft movements of all types.		85,908

* This assumes that faster service via DC 9-10 aircraft would reduce the percentage of passengers using air taxis.

TABLE 16: 1990 ANALYSIS, MODEL D

		Annual Passengers	Annual Aircraft Movements
1.	Total commercial passengers (CONNDOT).	860,000	
2.	Air taxi passengers. (30% of total.)	258,000	
3.	Total air taxi aircraft movements. (Based on 20-seat aircraft with 50% load factor.)		25,800
4.	Short- to medium-range certified air carrier passengers. (70% of total.)	602,000	
5.	Total short- to medium-range certified air carrier movements. (Based on 90-seat DC 9-10 with 40% load factor.)		16,722
6.	Total all-cargo aircraft movements. (Based on 8 movements/week.)		416
7.	Total general aviation aircraft movements.		64,740
8.	Total military aircraft movements.		9,000
9.	Total aircraft movements of all types.		116,678

TABLE 16. 1990 ANALYSIS, MODEL D

1. Total commercial passengers (COMMUTER).	860,000
2. Air taxi passengers. (30% of total.)	256,000
3. Total air taxi aircraft movements. (Based on 20-seat aircraft with 50% load factor.)	25,800
4. Short-to-medium-range certificated-air-carrier passengers. (70% of total.)	602,000
5. Total short-to-medium-range certificated-air-carrier movements. (Based on 90-seat DC-9-10 with 40% load factor.)	16,722
6. Total all-cargo aircraft movements. (Based on 8 movements/week.)	416
7. Total general aviation aircraft movements.	64,740
8. Total military aircraft movements.	9,000
9. Total aircraft movements of all types.	116,678

VI. EVALUATION OF THE FUTURE STATE PLAN FOR TRUMBULL AIRPORT

FUTURE STATE AIRPORT PLAN

MISSION AND PHYSICAL DESCRIPTION

In July of 1971 the State Department of Transportation presented publicly a Preliminary Layout Plan of Trumbull Airport as shown in Figure 13. The recommended mission for Trumbull as developed by the Bureau of Planning and Research of CONNDOT is to:*

1. Accommodate domestic short-range air carrier service for Southeastern Connecticut.

2. Accommodate general aviation, primarily full basing and service for corporate jet aircraft.

3. Provide for local air cargo needs.

4. Accommodate military mission of resident Army National Guard and Coast Guard, to the extent feasible within commercial air carrier mission.

5. Develop industrial air park for industries with special need for direct aircraft service.

In addition, the State noted that the Airport should provide support facilities consistent with federal aviation requirements.

As depicted on Figure 13, the State Plan recommends an 800-foot extension of the southwest end of Runway 5-23 with a 300-foot overrun on the northeast end. Also shown is a 2,400-foot approach lighting system, new taxiways and aircraft parking areas, two new seaplane ramps, a new access road to the northeast, an industrial service road to the northwest, two proposed industrial areas, an expansion of the terminal and parking areas, and the addition of 10 acres of land to the northeast portion of the Airport. Runway 10-28 is proposed for elimination along with several taxiways and the existing sea plane ramp. However, current indications are that Runway 10-28 will be retained for at least limited use.

Presumably the need for a runway extension is determined by the type of aircraft to be served and not by a need to increase the capacity of the Airport. To accommodate aircraft in the DC-9 category with no restrictions would require a runway extension as shown in Figure 12 (page 76).

The proposed approach lighting system (ALS) is a visual lighting device which aids the pilot when landing in his transition from instrument orientation within the cockpit to visual

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* Letter from George L. Sherwood, Airport Planner, CONNDOT, August, 1971.

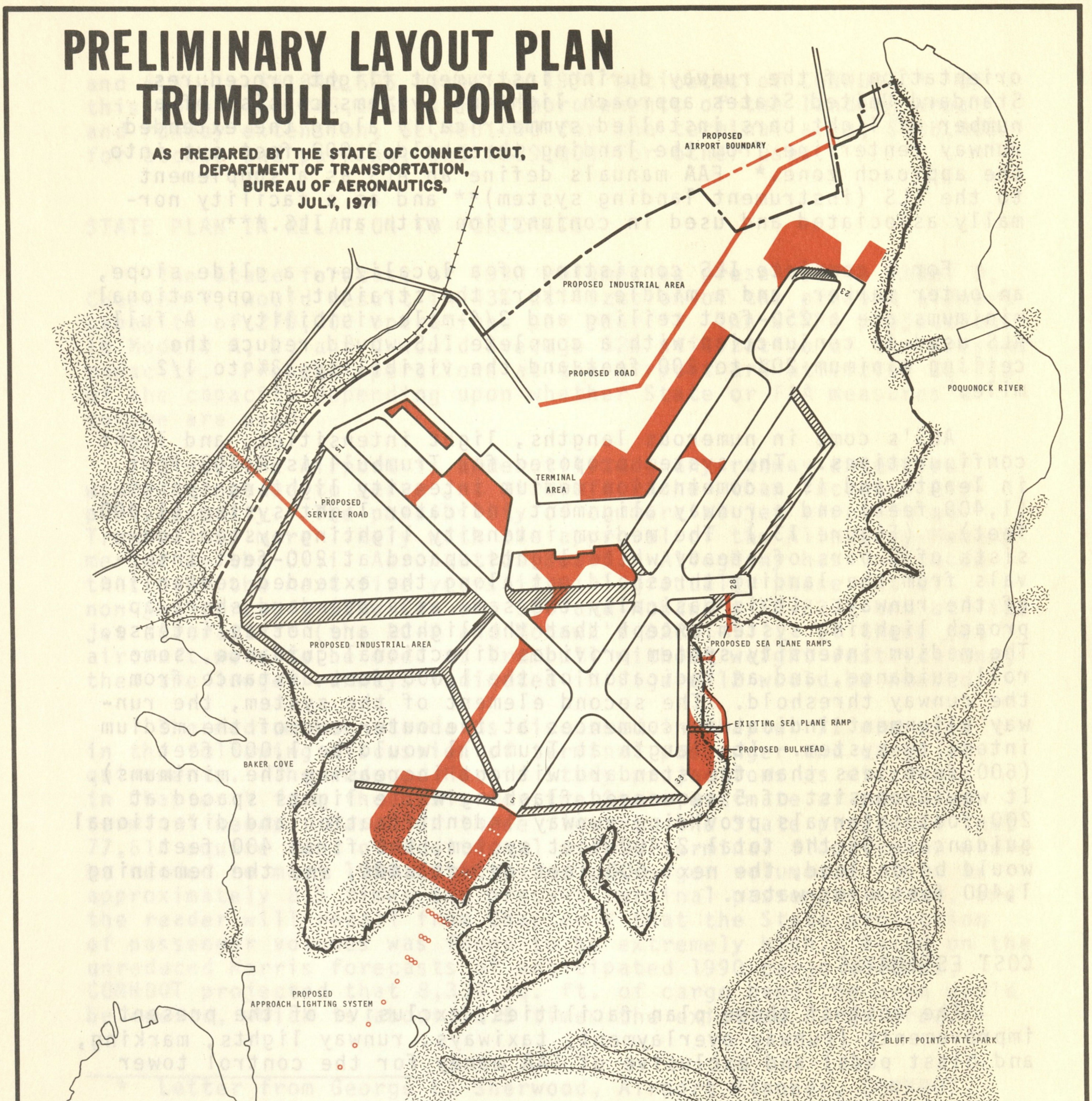
PRELIMINARY LAYOUT PLAN
TRUMBULL AIRPORT
AS PREPARED BY THE STATE OF CONNECTICUT,
DEPARTMENT OF TRANSPORTATION,
BUREAU OF AERONAUTICS,
JULY, 1971
PROPOSED AIRPORT BOUNDARY
PROPOSED INDUSTRIAL AREA
PROPOSED ROAD
POQUONOCK RIVER
TERMINAL AREA
PROPOSED SERVICE ROAD
PROPOSED INDUSTRIAL AREA
PROPOSED SEA PLANE RAMPS
EXISTING SEA PLANE RAMP
PROPOSED BULKHEAD
BAKER COVE
PROPOSED APPROACH LIGHTING SYSTEM
BLUFF POINT STATE PARK
PROPOSED MIDDLE MARKER
BUSHY POINT
LEGEND
EXISTING FACILITIES
RUNWAY AND TAXIWAY TO BE PHASED OUT
PROPOSED CONSTRUCTION
WETLANDS
AIRPORT BOUNDARY
0 400 800 1200
SCALE IN FEET
NORTH

FIGURE 13

orientation of the runway during instrument flight procedures. Standard United States approach lighting systems consist of a number of light bars installed symmetrically along the extended runway centerline from the landing threshold 3,000 feet out into the approach zone.* FAA manuals define an ALS as a supplement to the ILS (instrument landing system)** and as a facility normally associated and used in conjunction with an ILS.***

For a complete ILS consisting of a localizer, a glide slope, an outer marker, and a middle marker, the straight-in operational minimums are a 250-foot ceiling and 3/4-mile visibility. A full ALS used in conjunction with a complete ILS would reduce the ceiling minimum 20% to 200 feet and the visibility 33% to 1/2 mile.+

ALS's come in numerous lengths, light intensities, and light configurations. The system proposed for Trumbull is 2,400 feet in length and is a combination medium intensity lighting system (1,400 feet) and a runway alignment indicator light system (1,000 feet). (Figure 13.) The medium intensity lighting system consists of 7 bars of steady white lights spaced at 200-feet intervals from the landing threshold out along the extended centerline of the runway. It is basically the same as a standard short-approach lighting system except that the lights are not as intense. The medium intensity system provides directional guidance, some roll guidance, and an indicator of the 1,000 feet distance from the runway threshold. The second element of the system, the runway alignment indicator, commences at the outer end of the medium intensity system. Its length at Trumbull would be 1,000 feet (600 feet less than the standard without increasing the minimums). It would consist of 5 sequenced flashing white lights spaced at 200-foot intervals providing runway indentification and directional guidance. Of the total 2,400-foot system, the first 400 feet would be on land, the next 600 feet on wetlands, and the remaining 1,400 feet over water.

COST ESTIMATES

The cost of these plan facilities, exclusive of the present improvements (runway overlayment, taxiways, runway lights, marking, and blast pads) and exclusive of FAA money for the control tower

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* Federal Aviation Administration. U.S. Standard for Terminal Instrument Procedures, (TERPS), 2nd ed., Appendix 5, 1970, p. 1.

** Federal Aviation Administration, U.S. Government Instrument Approach Procedure Charts, April, 1968, p. 3.

*** Federal Aviation Administration. Airport Design Standards Site Requirements for Terminal Navigational Facilities, November, 1971, p. 8.

\+ TERPS, op. cit., Table 9, p. 33.

and ALS, is $6,842,696 based on 1971 estimates of CONNDOT.* Of this total, $3,245,696 is for improvements of the landing area and runway extension, $2,400,000 for the terminal area, $668,000 for access and parking, and $529,000 for other uses.

STATE PLAN IN RELATION TO FORECASTS

The State forecast of 1990 volumes as presented in Model D, Chapter V, would result in 43% utilization of the present airport capacity of 270,000 operations per year.** The SCRPA projections in Models A, B, and C would average 32% utilization of the present capacity. Present operations at the Airport are utilizing 16-21% of the capacity depending upon whether State or FAA measures of volume are used.

Since the Airport is underutilized, any runway extension would be needed to serve jet aircraft rather than increase Airport capacity. The possibility of commercial jet aircraft at Trumbull is more likely with the approval of the Allegheny-Mohawk merger by the Civil Aeronautics Board. Allegheny has indicated that over the next five years it will gradually phase out all non-jet aircraft (the Convair 580 and Mohawk's FH-227) and utilize jet aircraft*** (the DC-9 and Mohawk's BAC 1-11). If these jet aircraft were to be used at Trumbull without weight restrictions, then the longer runways indicated in Figure 12 would be needed.

The medium hub standards discussed in Chapter II are used in the following discussion of terminal passenger and cargo requirements. The reduced Harris Study projections as discussed in Chapter V form the basis for the State estimate of passenger terminal needs. Based on these figures, the State projected that 77,616 square feet of additional usable terminal floor space would be needed to meet 1990 anticipated passenger volumes.+ This is approximately 8.5 times the present terminal passenger space, and the reader will recall from Chapter V that the State projection of passenger volumes was found to be extremely high. Based on the unreduced Harris forecasts of anticipated 1990 cargo volumes, CONNDOT projected that 8,334 sq. ft. of cargo handling area would be needed, which is about 13.5 times the existing cargo area.++

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* Letter from George L. Sherwood, Airport Planner, CONNDOT, July, 1971.

** CONNDOT. Attachment to CONNDOT Airport Plan: Trumbull Airport Operations, 1971, p. 6.

*** Phone conversation with George King, Vice President, Public Affairs, Allegheny Airlines, April, 1972.

\+ CONNDOT. Attachment to CONNDOT Airport Plan: Analysis of Facilities, Trumbull Airport, 1971, p. 3.

++ *Ibid*., p. 4.

The SCRPA projections of anticipated 1990 passenger volumes indicate a need for 25,704 square feet of additional usable terminal floor space or 2.8 times the existing passenger space. SCRPA's projections of 1990 cargo volumes would result in a cargo area of 6,360 square feet or slightly over 10 times the present cargo area.

EVALUATION OF ENVIRONMENTAL IMPACT

In evaluating the Preliminary Layout Plan for Trumbull Airport, as shown in Figure 13, each of the proposals will be discussed in relation to its impact on the human and natural environments. Of major concern here are the proposed runway extension and the associated taxiway, the approach lighting system, and the seaplane ramps. Following this discussion will be an evaluation of the overall effects of increased operations at Trumbull Airport with respect to air and water pollution, crash hazards, and noise.

The proposed 800-foot extension of the main runway would require some filling of the wetlands to accommodate the outer 500 feet of pavement and the adjoining taxiway. Dr. Frank Bohlen of the University of Connecticut notes the potential danger to the wetlands if sediment is allowed to run off from the fill area either during or after construction.

> "The lower Poquonock River appears to be a sediment trap. This is evidenced by Bushy Point and the adjacent wetland areas, both of which represent aggrading land forms. This fact must be taken into account prior to any major filling operation on the river."*

Before any filling of the wetlands may be undertaken, a permit must be obtained from the Connecticut Department of Environmental Protection (DEP), in accordance with the Wetlands Act of 1969. In issuing a permit, the Commissioner may establish specific requirements to be met during or following construction. Additonally, an environmental impact statement will be required under the provisions of Section 102 of The National Environmental Policy Act of 1969.

With the proposed extension of the runway, storm run-off would enter directly into the wetlands. Dr. Robert DeSanto discusses this potential pollution problem.

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* Letter from W. Frank Bohlen, Ph.D., Marine Sciences Institute, University of Connecticut, Avery Point Branch, Groton, Connecticut, January 1972.

> "Relative to liquid pollution, such as oil gasoline, kerosene, antifreeze, de-icers, etc., it is most usual for such materials to wash off runways into the surrounding drainage pattern. Such a pattern must be avoided in this case, perhaps through the use of sumps which would receive run-off to be pumped off-site for treatment prior to release."*

Construction of an approach lighting system (ALS) at Trumbull Airport would require the installation of twelve sets of pilings at 200-foot intervals from the end of the main runway to support the light structures. The first two sets would be on land, the next three within the wetlands, and the remaining seven in the water.

Dr. Robert DeSanto comments on the potential impact of the ALS on the environment.

> "ALS beacons placed in the water do not appear to me to offer much ecological danger. However, construction manipulations are likely to have very marked adverse effects on the marsh should beacons be placed on the marsh itself."**

Commander Ronald Kollmeyer indicated that the pilings could "collect sediment on their downstream sides as well as interfere with the overall circulation and flushing. The extent of this effect can only be predicted from some detailed studies of the current patterns, sediment size and aquatic plant density in [the] area."***

As with the proposed runway extension, a permit must be obtained from the Connecticut Department of Environmental Protection (DEP) before any construction of ALS pilings may be undertaken and an environmental impact statement will be required. Recently, the DEP issued a permit for the construction of an ALS at Bridgeport Municipal Airport. The permit requires submission of detailed plans to the Commissioner for approval before start of construction and frequent inspection by DEP while the work is in progress. This permit, it should be noted, is currently being appealed in the courts.

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* Letter from Robert S. DeSanto, Ph.D., Zoology Department, Connecticut College, New London, Connecticut, February 1972.

** Letter from Robert S. DeSanto , Ph.D., <u>op. cit</u>.

*** Letter from Commander Ronald C. Kollmeyer, oceanographer with United States Coast Guard and member of the Groton Conservation Commission, January 1972.

The Bridgeport ALS involves an extensive area of wetlands and should provide a good basis for evaluating the effects of construction and ALS pilings on the natural environment. In our judgement, any decisions regarding construction of an ALS at Trumbull Airport should be postponed until the Bridgeport system and all subsequent evaluations are completed. The Bridgeport ALS should take approximately one year to complete once the start of construction has been authorized.

Because an ALS at Trumbull would obstruct existing, federally-controlled navigable waters, approval by the Army Corps of Engineers would also be required.* If a catwalk is constructed between the pilings, all boats would be effectively barred from passing through the light structures. Without a catwalk, mast height limitations of boats would be necessary to avoid interference with the lights.

There are many unanswered questions regarding the proposed ALS at Trumbull Airport. There is a definite need for additional data on the existing wildlife and water circulation and flushing patterns in the estuarine/wetlands ecosystems and a detailed description of the construction necessary for the installation of the ALS. The probable impact on recreation in the vicinity of the Airport also deserves further study. With this information and the experience gained from the construction of the Bridgeport ALS, better judgement can be given in the final decision regarding the Trumbull Airport ALS.

It should be noted that the Preliminary Layout Plan for Trumbull Airport (Figure 13) shows the ALS in line with and extending from the existing runway. If the runway is extended 800 feet, the ALS would also need to be extended 800 feet further than shown on Figure 13.

The two proposed sea plane ramps along the Poquonock River would replace a single existing ramp. This project would include the construction of a bulkhead and filling of some wetlands in the vicinity of the existing ramp.

As mentioned before, any construction in the wetlands would require a permit from the Connecticut Department of Environmental Protection. The potential dangers from a filling operation here would be similar to those presented with the runway extension and should be thoroughly evaluated before a permit is issued.

Also of concern with the expanded sea plane facilities is the increased pollution potential following from increased traffic on the Poquonock River. Gasoline or oil leakage from an individual sea plane enters directly into the marine environment and, therefore, has a greater immediate impact than its land

* Meeting with Federal Aviation Administration officials, Burlington, Massachusetts, March 13, 1972.

counterpart.

Another concern arising from the possibility of increased sea plane traffic at Trumbull Airport is related to the overall recreational use of the area. Commander Ronald Kollmeyer comments on the proposed sea plane ramps.

> "The proposed sea plane ramps would effect only a small portion of the shore line. I oppose these however on the basis of possible sea plane lanes which might be established within the river thus restricting water sports activities."*

With the development of Bluff Point State Park, this demand for water sports activities can be expected to increase.

It appears there should be further evaluation of the need for the proposed sea plane ramps, especially with reference to the potential conflict with the natural environment and human recreational use of the Poquonock River.

One other proposal could intrude into an area of wetland. This is the proposed new access road to serve the future industrial area on the western side of the Airport.

The remaining proposals presented in the Preliminary Layout Plan for Trumbull Airport are generally restricted to the Airport property and do not infringe upon the wetlands. Terminal expansion and industrial development can be expected to increase the demand on the sewage treatment plant. Only when the quantities and precise nature of the wastes are known can the adequacy of the existing facility's capacity be evaluated.

The Preliminary Layout Plan for Trumbull Airport presents a number of proposals which together would support a significant increase in passengers, air traffic, and size of aircraft. Even without any major modifications of the existing facilities, the number of passengers and the air traffic can be expected to grow, though at a lesser rate.

As aircraft operations increase, the stress on the surrounding environment will also increase. However, major improvements in aircraft and/or airport facilities might somewhat offset the magnitude of these increases. As discussed in relation to current operations at Trumbull Airport, the areas of major environmental impact include air and water pollution, crash hazards, and noise.

Air pollution from aircraft has been under increased study

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* Letter from Commander Ronald C. Kollmeyer, op. cit.

since the passage of the Air Quality Act of 1967.* Both government and industry have conducted research for the development of new engines with lower emissions and more accurate techniques for measuring aircraft pollutants. The Air Quality Amendments of 1970 have placed the responsibility for establishing aircraft emission standards with the Environmental Protection Agency.

Whether through new technology or new regulations, Trumbull Airport and the Town of Groton will benefit from any improvements to aircraft. However, an increase in total operations at the Airport could offset the effects of improved aircraft.

Mainly with regard to major airports, it has been suggested that reduction of idling and taxi time would significantly lower the level of aircraft emissions at an airport. This is due to the large amount of time spent in circling above airports and waiting on the ground for clearance to proceed with landings or take-offs. This is not presently a problem at Trumbull Airport, but it should be kept in mind when scheduling additional flights in the future.

Water pollution, as discussed in Chapter IV, stems mainly from run-off from the runways and taxiways. With the present facilities and operations, there do not appear to be any critical adverse effects from drainage into the wetlands and/or adjacent streams. But no extensive studies of water quality have been conducted in the vicinity of the Airport. If a substantial increase in operations were to occur, the increased drainage could have adverse effects on the marine environment. In this case, treatment of storm water run-off, as previously suggested by Dr. DeSanto, might reduce the impact on the wetlands. This type of system is not presently included in the State plan for Trumbull Airport.

The problem of crash hazards will not be altered greatly in the future, unless Airport operations exceed the recommended capacity, which is unlikely. Trumbull Airport is now considered a safe airport, provided the FAA (Federal Aviation Administration) landing criteria are adhered to. The FAA establishes what they consider to be safe criteria for landings and takeoffs, based on the available navigational aids at a given airport. Therefore, with an ALS, which is a navigational aid, the minimums would be

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* Information regarding progress in the control of aircraft emissions was obtained from the following papers presented in the Conference Proceedings, Parts I and II, Conference on Aircraft and the Environment, February, 1971: George D. Kittredge and Barry D. McNutt. "Role of NAPCA in Controlling Aircraft Pollutant Emissions."
William T. Westfield. "The Current and Future Basis for Aircraft Air Pollution Control."
G.P. Sallee. "Status Report on Aircraft and Airports as Sources of Pollution."

lowered at Trumbull Airport while maintaining the overall safety. However, as expressed in Chapter IV, the skill and judgment of a pilot and the condition of his aircraft remain the prime factors in preventing airplane crashes.

Aircraft noise will continue to be the greatest environmental problem at Trumbull Airport. However, to predict the future noise situation accurately, it would be necessary to know precisely the noise characteristics of new aircraft, the types of aircraft using Trumbull Airport, the total volume of operations, and the number of day and night operations. Unfortunately this is not possible. But it is possible to review the efforts currently being made to reduce aircraft noise and to make some relative comparisons with regard to alternative future uses of Trumbull Airport.

Noise reduction technology has been directed towards both operational procedures of aircraft and aircraft design modifications.* Currently, there are a variety of noise abatement procedures practiced, of which the predominant one is power cut-back during take-offs. But with every alteration in procedure, there is also a reduction in the level of performance. This factor limits the number of alterations which are feasible and safe to consider. However, future changes in aircraft design may remove some of the operational limitations of existing aircraft.

Noise research in the area of aircraft design and technology has been and is currently being supported by both government and industry. One successful product of this research has been the development of a new engine concept, the high-bypass-ratio engine, which has greater noise reduction possibilities than any previous engines. Continued efforts in this area are likely to produce additional breakthroughs in the reduction of aircraft noise.

Retrofitting and/or replacement of aircraft engines has been proposed to reduce the noise production of existing airplanes. There are a number of alternatives available, but closer evaluation is needed before a course of action is pursued. Once a commitment is made, a successful program is expected to take at least 5 to 6 years to complete. Advances made in aircraft design and operational procedures should improve the overall noise problem at Trumbull Airport, but it is impossible to predict the actual benefit that will accrue to the town. However, variations in the level of operations and types of aircraft at Trumbull Airport would definitely and directly affect the noise impact and can be evaluated relative to 1971 operations and aircraft noise levels.

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* Information regarding aircraft noise reduction was obtained from the following papers presented in the Conference Proceedings, Part I, Conference on Aircraft and the Environment, February, 1971: John O. Powers and T.P. Ball. "Noise Reduction Operational Procedures." R.E. Russell and J.D. Kester. "Aircraft Noise, Its Source and Reduction."

Chapter V presents and evaluates the passenger projections for Trumbull Airport as derived by the Harris study and revised by the Connecticut Department of Transportation (CONNDOT). Then a new projection is offered, based on SCRPA's population projections for the Region and several assumptions regarding the Airport's future service.

Using the passenger projections of SCRPA and CONNDOT, four models of assumed future conditions of Trumbull Airport are presented for noise impact analysis, using 1990 as the target year. With all four models, general aviation and military operations are identical. Commercial and cargo operations vary among models according to the assumptions made concerning the passenger projection, runway length, and the type of aircraft, which are summarized in Table 17. (Detailed descriptions of the future models can be found in Chapter V, starting on page 88.)

TABLE 17: BASIC ASSUMPTIONS USED IN PREPARING FUTURE ANALYSIS MODELS OF TRUMBULL AIRPORT

MODEL	COMMERCIAL PASSENGER PROJECTION SCRPA	CONNDOT	RUNWAY LENGTH 5,000'	5,800'	TYPES OF AIRCRAFT
A	212,000		X		Same as present mix
B	212,000		X		STOL and air taxi
C	212,000			X	DC-9 and air taxi
D		860,000		X	DC-9 and air taxi

With the information provided in the future models, it is possible to develop Noise Exposure Forecasts (NEF), such as the one prepared for existing conditions in Chapter IV, for purposes of comparison. A discussion of NEF's and their interpretation is presented in Chapter IV, starting on page 57.

There are limitations in applying the current NEF computer program to future conditions. Present noise configurations for each aircraft class will alter when noise abatement measures are effected, and new aircraft classes can be expected to evolve. Operational modifications could also change the noise pattern of each aircraft. However, for purposes of comparison and reference, the present NEF procedure is the best available. It is also reasonable to assume that advancements in noise abatement technology will benefit all types of aircraft, and thus, will not alter the relative impacts of the four models.

TRUMBULL AIRPORT
NOISE EXPOSURE FORECAST CONTOURS FOR 1990 OPERATIONS, MODEL A

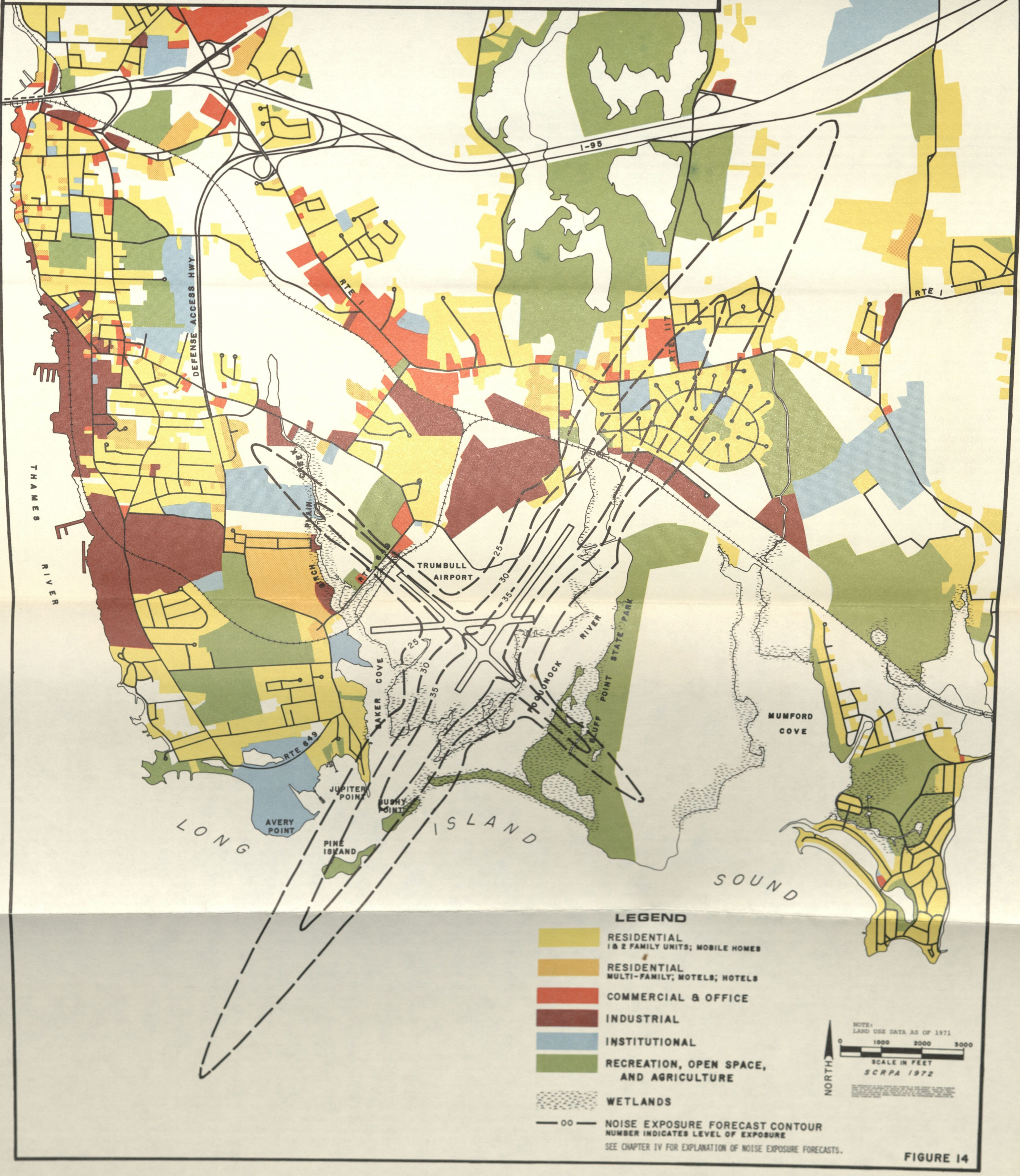
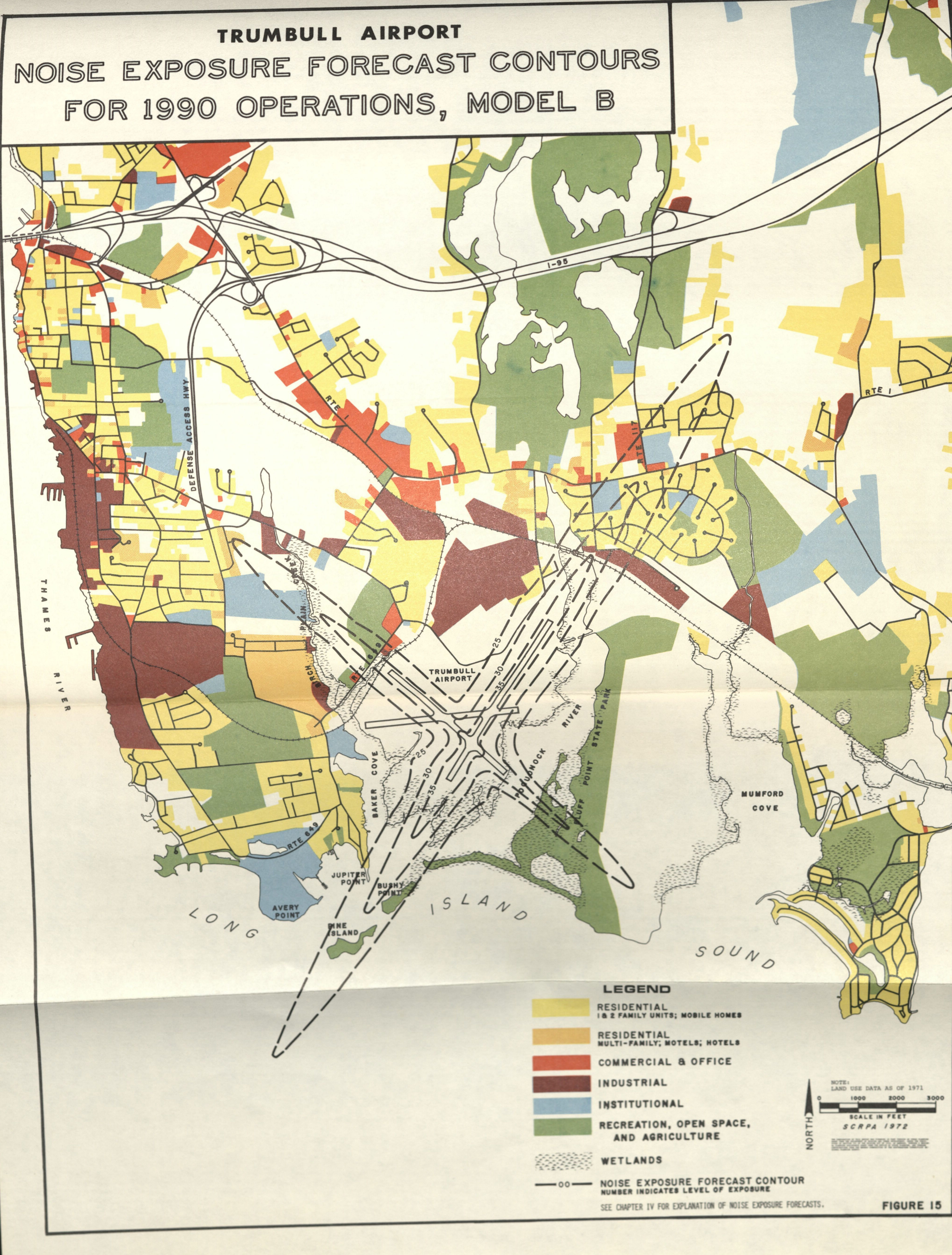


FIGURE 14



TRUMBULL AIRPORT
NOISE EXPOSURE FORECAST CONTOURS
FOR 1990 OPERATIONS, MODEL B
I-95
RTE 1
RTE 117
DEFENSE ACCESS HWY
THAMES RIVER
BIRCH PLAIN CREEK
RTE 649
TRUMBULL AIRPORT
25
30
35
BAKER COVE
POQUONOCK RIVER
BLUFF POINT STATE PARK
MUMFORD COVE
JUPITER POINT
BUSHY POINT
AVERY POINT
PINE ISLAND
LONG ISLAND SOUND
LEGEND
RESIDENTIAL
1 & 2 FAMILY UNITS; MOBILE HOMES
RESIDENTIAL
MULTI-FAMILY; MOTELS; HOTELS
COMMERCIAL & OFFICE
INDUSTRIAL
INSTITUTIONAL
RECREATION, OPEN SPACE, AND AGRICULTURE
WETLANDS
00 NOISE EXPOSURE FORECAST CONTOUR
NUMBER INDICATES LEVEL OF EXPOSURE
SEE CHAPTER IV FOR EXPLANATION OF NOISE EXPOSURE FORECASTS.
NORTH
NOTE:
LAND USE DATA AS OF 1971
0
1000
2000
3000
SCALE IN FEET
SCRPA 1972

FIGURE 15

TRUMBULL AIRPORT
NOISE EXPOSURE FORECAST CONTOURS FOR 1990 OPERATIONS, MODEL C

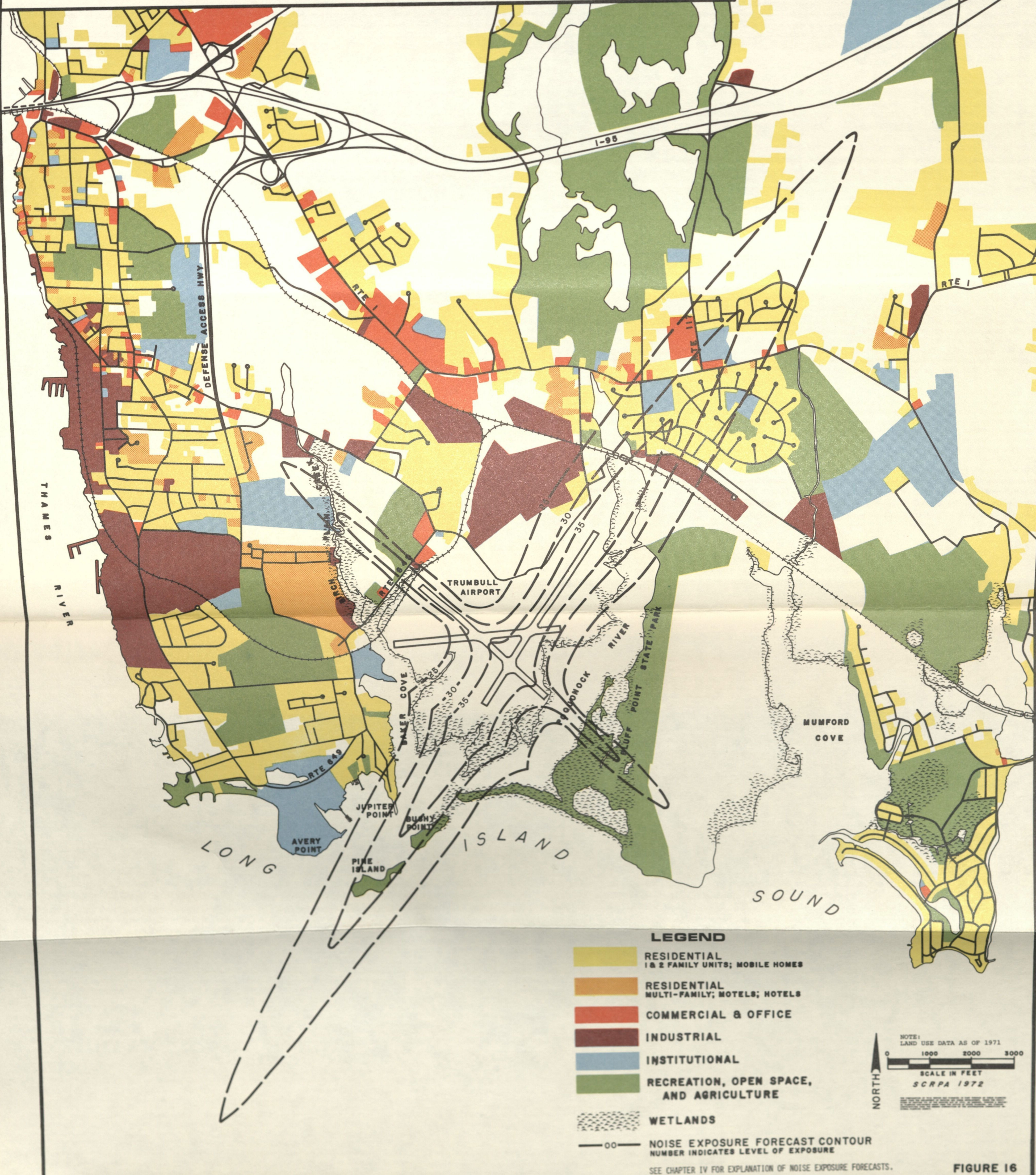
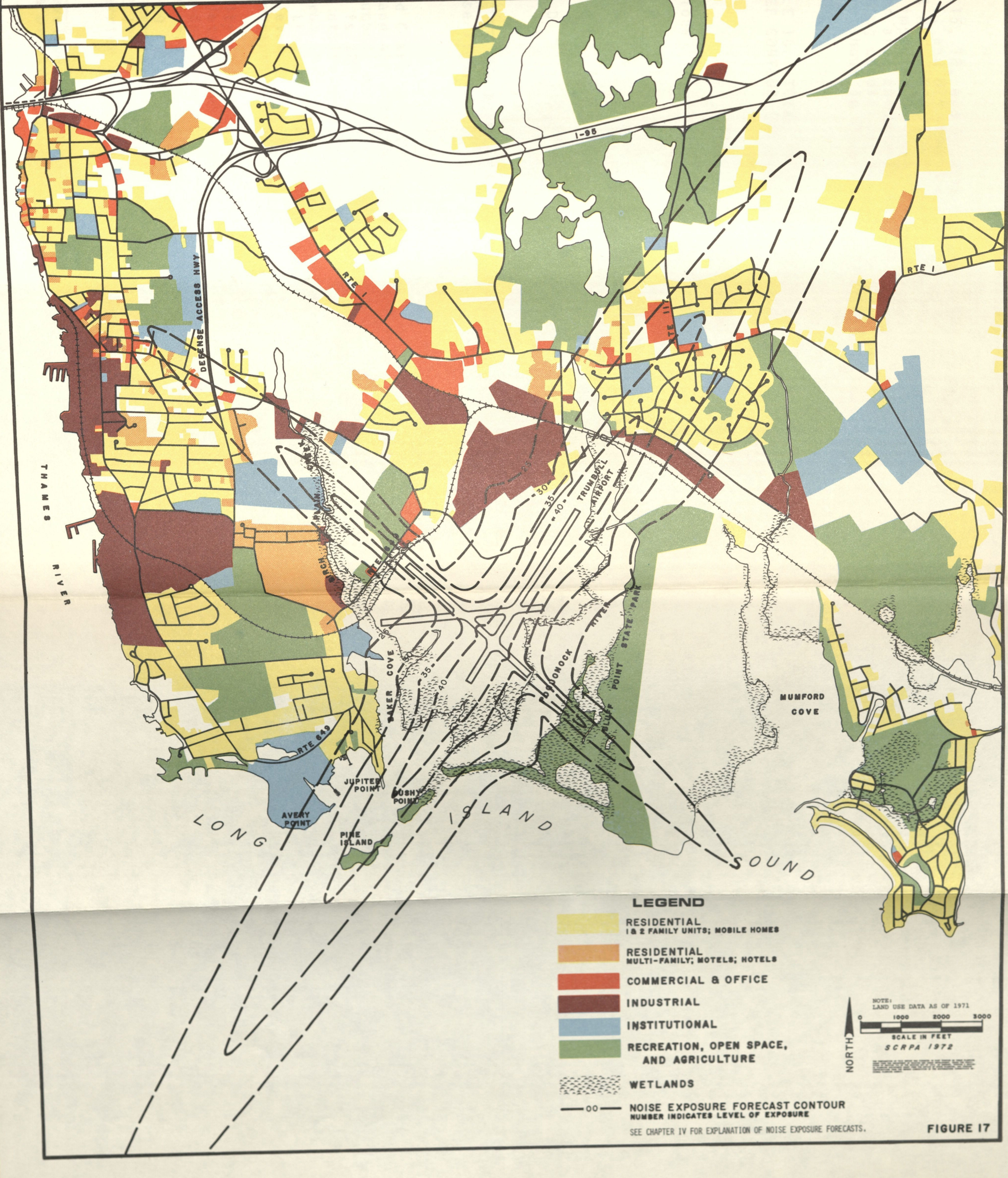


FIGURE 16

TRUMBULL AIRPORT

NOISE EXPOSURE FORECAST CONTOURS FOR 1990 OPERATIONS, MODEL D



SEE CHAPTER IV FOR EXPLANATION OF NOISE EXPOSURE FORECASTS.

FIGURE 17

Figures 14, 15, 16, and 17 show the NEF contours as derived for Models A, B, C, and D.* The outer contour on each figure represents the 25 NEF, which encloses the general area that would be significantly impacted by aircraft noise. In the table below, the land and water area encompassed by the 25 NEF in each model and for the existing conditions is given. (The NEF's for existing operations are shown in Figure 11, Chapter IV).

TABLE 18: TOTAL AREA ENCOMPASSED BY THE 25 NEF CONTOUR (IN ACRES),** 1971 AND 1990

	LAND	WATER	TOTAL
1971 Operations	688	269	957
1990, Model A	980	430	1,410
1990, Model B	697	205	902
1990, Model C	950	426	1,376
1990, Model D	2,086	1,049	3,135

** Those sections of the Airport within the 25 NEF contour are included in these figures.

Models A and C are very close in total area and are, respectively, 47% and 43% greater than the total area for existing operations at Trumbull Airport. Model D shows the greatest area of impact, which is 228% larger than that under existing conditions. Model B, utilizing STOL aircraft, is the only model showing a decrease from 1971 conditions in area impacted, and this is by slightly less than 6%. It should be kept in mind that this reduction is achieved in the face of a projected 187% increase in total aircraft movements between 1970 and 1990.

The similarity in Models A and C may seem illogical due to the use of DC-9 jets in the preparation of Model C. It is true that on a one-to-one basis, the DC-9's produce more noise than the turbo-prop aircraft now in use at Trumbull. However, due to the larger seating capacity of the DC-9's and their larger share of the total commercial passengers, the number of air taxi movements drops by 2,120 (or 25%) from Model A to Model C, while certified air carrier movements increase by only 408 (or 8%).

* These were developed through a computer program of CONNDOT, based on data provided by SCRPA.

Thus, the drop in total aircraft movements has offset the increased noise of individual aircraft. This balancing factor would not continue to favor the DC-9's at higher levels of operation.

Model B shows a NEF configuration for Trumbull Airport if STOL (short-take-off-and-landing) aircraft were to replace the present certified air carriers. The cross-wind runway (NW-SE) configurations are slightly larger here than in the other models but considerably smaller on the main runway. The reason for the more even distribution of the noise impact is due to the more frequent use of the cross-wind runway by smaller aircraft. It is clear that STOL aircraft, even with no improvement in their noise production, make by far the least impact of the four alternatives studied.

Model D has been presented to show the potential extent of the noise impact of Trumbull Airport if the CONNDOT projections were to be realized.

IMPACT OF INDUSTRIAL DEVELOPMENT AT THE AIRPORT

Trumbull Airport currently encompasses 480 acres of land, all of which is zoned IB-80. An IB-80 zone permits development of medium industrial uses on lots of 80,000 square feet or greater. Approximately 110 acres of this area is currently proposed for industrial development on the State Department of Transportation's most recently prepared plan for the Airport. Under IB-80 zoning, maximum building coverage of 30% is permitted, which would enable 1,437,480 square feet of industrial buildings to be constructed.

Unfortunately, because of State ownership, no tax revenues on either the land or buildings are currently received by the Town of Groton. However, the Airport property, as indicated in Table 19, has been assessed at $10,080,000 and the existing buildings are assessed at $1,013,770. Based upon these assessments and the Town's 1971-72 tax rate of 48.3 mills, the Town is currently being deprived of revenues which would total $535,829. The only current tax revenue which does accrue to the Town is approximately $2,730 from the assessed value of personal property, including aircraft, based at Trumbull.

If the proposed industrial areas were somehow released from State ownership, developed, and added to the Town's Grand List, the Town would receive revenues in excess of $840,000. This assumes that the assessed value of both the land and new buildings would become taxable real estate.

Another impact which possible industrial development of Airport property would have is that of a generator of new jobs for the Region. It is generally recognized that industrial development, of the type that might occur at Trumbull, generates approxi-

TABLE 19: TRUMBULL AIRPORT - ASSESSMENTS AND REVENUES, 1971

Existing Conditions	Assessment*	Tax Revenues**
480 acres @ $21,000 an acre	$10,080,000	($486,864)***
Terminal, crash and fire building, hangars, etc.	1,013,770	(48,965)
Personal property, 3 aircraft and leases	56,515	2,730
Potential If Airport Industrial Sites Were Put to Private Use		
110 acres of industrial area @ $21,000	2,310,000	111,573
1,437,480 sq. ft. of building @ 30% coverage x $10.50 per sq. ft.	15,093,540	729,017
		$840,590

SOURCE: All assessment data provided by Town of Groton Tax Assessor.

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* Assessments represent 70% of total value and are based on 1971 values.

** Tax revenues are computed at the 1971-72 mill rate of 48.3. These revenues would be somewhat less if the new Grand List prepared in 1971 was used.

*** ( ) indicates potential revenues from currently tax exempt property.

mately 16-18 jobs* per acre of land. Assuming maximum development, 1,700-2,000 new jobs could be generated for Southeastern Connecticut. Industrial development at Trumbull might also aid the economy as a result of spinoff commercial and industrial development.

SECONDARY IMPACT ON ANCILLARY FACILITIES AND SERVICES

Previous sections indicated that proposed expansion would have little if any effect on the existing municipal sewer and water systems serving the area. Therefore, this discussion will focus on the impact that increased traffic would bring to the Groton community and Southeastern Connecticut. The current highway system serving Trumbull Airport cannot support major expansion as proposed without drastic overhaul. Two possible proposals for providing this access are currently under consideration. One includes a proposed extension to the Defense Access Highway following either Poquonock Road or a new alignment further to the south. It is the understanding at this writing that this route is currently being investigated by the State Department of Transportation. A second route via a realignment of Route 1 was proposed to the State by the Town of Groton in 1970 and 1971. The expenditures necessary to improve access to the site would be considerable.

Another alternative which might receive consideration for improving access to the Airport is the utilization of the existing rail beds which could provide rather diversified service between the Airport property and other areas within Southeastern Connecticut. If Trumbull Airport is a facility which is to serve Southeastern Connecticut, then the possibility of using Budd cars for passenger service and freight cars for the transfer of cargo could be a method whereby improved access could be provided to the Airport without having to spend additional funds for additional highways. Careful study might prove quite fruitful when one recognizes the location of the area's existing major industries and their proximity to the existing rail line. For example, Pfizer, Electric Boat, the Submarine Base, Dow Chemical and King/Seely/Thermos could all be served by the Penn Central line on the east bank of the Thames River. Development of such a transportation system using these rail beds might provide an extremely viable link between not only the Airport and the Region, but also an effective means of intraregional circulation.

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* DeChiara, Joseph, and Koppleman, Lee. Planning Design Criteria. Van Nostrand Reinhold Company, New York, New York, 1969, p. 247.

VII. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Based on the preceding analysis, the following conclusions were approved by the Southeastern Connecticut Regional Planning Agency at a meeting on 14 August 1972 and by the Town of Groton Planning Commission at a meeting on 7 September 1972.

1. Commercial air traffic through Trumbull Airport has been relatively stable over the past 4 years.

2. The Airport's market area is confined chiefly to Southeastern Connecticut.

3. A high percentage of trips through Trumbull involve transfers at other airports.

4. The present capacity of the Airport to handle aircraft movements is far above its current volume.

5. With completion of the repaving of Runway 5-23 this summer, the Airport could accommodate substantially heavier aircraft than presently use it on a scheduled basis.

6. In terms of travel time, ground transportation is a strong alternative to air only for travel from Groton to Manhattan.

7. Bradley and Green Airports offer feasible alternatives to Trumbull for service to Washington, D.C., to those people living in the northwestern or southeastern sections of the Region.

8. There is only limited direct economic benefit to Groton and a net dollar loss to the State from the operation of Trumbull Airport. The provision of an airport is viewed by the State as a service provided as part of a comprehensive transportation system not necessarily as a moneymaker.

9. The Airport, at its present level of operation, does not appear to have affected adversely the values of nearby residential properties.

10. Major industries and institutions in Southeastern Connecticut use the Airport and generally consider it a valued asset. However, it has not been possible to quantify the importance of the Airport to these firms and institutions. It is probable that the military and industrial interests within the Region are substantial enough to exert considerable influence on the Civil Aeronautics Board to meet their air service needs.

11. No current significant adverse impacts on the highway,

water or sewerage systems in Groton have been identified as traceable to the Airport.

12. Significant human and natural environmental values now exist around the Airport. The major impact on these from the Airport is noise. About 3,000 persons live or work within the area estimated to have a noise impact severe enough to be of concern. All future plans should be designed to minimize this impact.

13. The future growth potential of Trumbull Airport will be influenced by a number of factors, paramount among which will be the economic and population growth of the Southeastern Connecticut Planning Region.

14. Southeastern Connecticut seems unlikely in the foreseeable future to have an adequate passenger market to justify direct, nonstop service beyond the range presently being served. However, an adequate market for expanded service might be developed if Trumbull were tied to a route connecting several other small airports.

15. It seems unlikely that the Region can generate sufficient air freight to justify the development of Trumbull as a <u>major</u> air freight terminal.

16. Due to the recent merger of Allegheny and Mohawk Airlines and their stated intent to convert to an all jet fleet, one can expect strong pressure to fly jet aircraft out of Trumbull Airport on a regularly scheduled basis if Allegheny Airlines continues to provide passenger service to Southeastern Connecticut.

17. High-speed rail service could be a reasonable transportation alternative in the Northeast Corridor by the late 1970's if strong Congressional support is forthcoming. Current proposals for the Northeast Corridor include a Federal Department of Transportation proposal for a new direct route between Boston and New Haven; a Geo-Transport Foundation proposal for a new route, Boston to Providence then direct to New Haven; and current proposals of the State to improve and upgrade the existing shoreline route. In each of these 3 proposals, the primary objective is moving people between major population centers, and it is unlikely that a stop would be provided in Southeastern Connecticut unless substantial political pressure can be brought to bear by our local legislators.

18. Short-take-off-and-landing aircraft suitable for short-range scheduled passenger service have reasonably good prospects of being available by the early 1980's.

19. Previous State forecasts of commercial passenger and cargo volumes for Trumbull Airport are highly optimistic,

and they bear no valid relationship to the probable economic and population growth within Southeastern Connecticut.

20. The SCRPA/GPO projections for 1990 analyzed in this report would utilize only 32% of Trumbull Airport's present capacity of 270,000 aircraft operations per year. Thus, runway extension could be justified only to permit service by large jet aircraft. Extensions clearly are not needed because of inadequate capacity.

21. State projections of 1990 terminal space requirements are considerably higher than the SCRPA/GPO passenger and cargo forecasts indicate will be needed.

22. Extension of Runway 5-23, as proposed by the State, will require filling of tidal wetlands protected under Connecticut's Wetlands Act of 1969.

23. The Approach Lighting System proposed by the State would encroach on tidal wetlands and into navigable recreational waters. Installation of an ALS would lower the minimums under which aircraft may land at the Airport.

24. Aircraft noise will continue to be the greatest environmental problem around Trumbull Airport. Analysis of four different models of possible future conditions indicates that even with no reduction in aircraft noise generation levels the SCRPA/GPO projected volumes for 1990 could be served with a slight reduction from the present noise impact if service were provided exclusively by short-take-off-and-landing aircraft. Service by turboprop planes would increase the area of noise impact by about 47%, while the increase if service were by DC-9 jet aircraft would be 43%. Should the State's forecast of 1990 operations actually occur, the area of noise impact would be 228% greater than at present.

25. If the areas at Trumbull proposed for future industrial use were released from State ownership, added to Groton's grand list, and developed, the Town would obtain an estimated $840,000 in tax revenue at current rates. The Town presently receives less than $3,400 from the Airport in both taxes and a State grant-in-lieu-of-taxes.

26. The secondary impact on Town facilities and services of the State's proposed expansion plan does not appear to be very substantial with respect to water and sewer service or traffic circulation.

RECOMMENDATIONS

After careful consideration of the findings of this study and of the views expressed by the special study review committee, the following recommendations were adopted by SCRPA at its August 14th meeting and by the Town of Groton Planning Commission at its September 7th meeting. For ease of comparison, the recommendations are presented in parallel columns. Where a gap occurs, it indicates that one of the organizations did not have a recommendation on a particular point.

It is hoped that the recommendations resulting from this joint study will be used by local and State officials in developing a policy for the future of Trumbull Airport. The several boards and commissions of the Town of Groton are urged to consider possible endorsement of the recommendations presented below.

SCRPA RECOMMENDATIONS	TOWN OF GROTON PLANNING COMMISSION RECOMMENDATIONS
TO THE STATE:	TO THE STATE:
• Trumbull Airport should remain a small feeder airport providing connection to larger airports and direct service to a limited number of cities within a 500-mile radius.	• The State should delineate Trumbull Airport's function as that of a small feeder airport serving Southeastern Connecticut. Commercial air service should be limited to providing direct, nonstop service with a 350 nautical mile radius.
• The State should prepare and implement a plan of environmental protection for Trumbull Airport.	• State legislation should be amended and the Department of Transportation should adopt a policy immediately requiring that a detailed environmental impact analysis and statement be prepared during the planning phase of any physical improvement to the Airport facility, whether such improvement is done by the State, Federal Government or private individual or firm. This analysis and statement should be prepared by the State Department of Environmental Protection and should be made available to both local officials and the general public prior to the appropriation of final project funding. The result of these statements should be the establishment of environmental protection plans for the Airport which should be enforced by the State Department of Environmental Protection.
• SCRPA recommends the preparation of a detailed environmental impact analysis before any decision is made relative to the installation of an Approach Lighting System for Trumbull Airport.	• Such an analysis as called for above should be undertaken immediately to determine the impact which the proposed Approach Lighting System would have on the surrounding environment.

SCRPA recommendations, continued

- SCRPA opposes any runway extension at this time. The Agency intends to conduct periodic reviews in the future of the need for runway extension.

- The Town of Groton and the State should open negotiations aimed at establishing a grant-in-lieu-of-taxes to the Town which will more equitably reflect the taxes lost to Groton by State ownership of Trumbull Airport.

- Consideration should be given by the State to both noise impact and potential crash hazards in selecting areas for intensive public use within Bluff Point State Park and in expanding facilities related to the University of Connecticut branch at Avery Point.

- A detailed noise inventory around the Airport should be completed by the State to provide a basis for identifying future improvement or deterioration in noise pollution.

- The Town of Groton and the State of Connecticut jointly should establish and adopt a policy on aircraft noise levels resulting from Trumbull Airport's operation. This policy should establish both geographic and sound level limits

Planning Commission recommendations, continued

- The State should initiate an immediate study of airport operation practices and establish regulations which would prohibit operational practices such as incentives regarding completion of flights, reduction of airport minimums and other such measures currently practiced by the airline industry which are detrimental to passenger safety.*

- Further periodic reviews of the future need for runway expansion should be conducted. No runway extensions should be made at this time and indications of runway expansion should be deleted from the State's Master Plan for Trumbull.

- The State Department of Transportation should be authorized to complete investigations and begin development of alternative mass transit systems such as improved rail service in the Northeast Corridor to alleviate the demands generated for increased air traffic.

- The State Legislature should adopt legislation in the next session of the General Assembly which would establish a more equitable grant-in-lieu-of-taxes formula to more fairly reimburse towns for the loss in tax revenues which results from State ownership of airport facilities.

- The State Department of Environmental Protection should give careful consideration to both noise impact and potential crash hazards when drafting revised proposals for public use within Bluff Point State Park. The University of Connecticut should follow similar action when considering expansion of their facilities at Avery Point.

- The State Department of Environmental Protection should conduct a complete and detailed noise inventory and analysis around the Airport's periphery and establish definitive standards regarding acceptable noise limits.

- State statutes should be amended in the next session of the General Assembly to permit towns to adopt regulatory measures to control noise levels within and above their corporate limits and such powers should be enforceable with

* SEE: National Transportation Safety Board. Aircraft Accident Report Allegheny Airlines, Inc., Allison Prop Jet Convair 340/440, N5832, New Haven, Connecticut, June 7, 1971. Washington, D.C., 1972, pp. 20-21.

SCRPA recommendations, continued

on future noise pollution from the Airport and should be related to the physical and emotional well-being of residents of Groton.

- A continuing committee with representation of appropriate State, Town, and regional interests should be formed to develop a detailed long-range plan for Trumbull Airport.

- Trumbull Airport should be developed as a short-take-off-and-landing airport as quickly as feasible and should be so designated on the State Master Transportation Plan.

- SCRPA recommends elimination of the future access road projected across tidal wetlands along the western border of the Airport and of the seaplane ramps into the Poquonock River from the State's future plan for Trumbull Airport.

TO THE TOWN:

- The Town should negotiate with the State regarding possible transfer or sale to the Town of property within the Airport boundary which is not considered essential for Airport operation.

Planning Commission recommendations, continued

respect to all actions within the towns whether generated by private, State, or Federal facilities.

- Section 13b-44 of the Connecticut General Statutes should be amended to require the establishment of a joint planning committee comprised of local, regional and State representatives to participate in the preparation of all Master Plans for the State's airports.

- The State Department of Transportation should be required to prepare a cost-benefit analysis for each project proposed at Trumbull Airport. The value of proposed expenditures should be carefully weighed against the savings derived by those identified as the project's beneficiaries.

- Trumbull Airport should be developed as a short-take-off-and-landing airport and should be so designated on the State's Master Transportation Plan.

- The State Department of Transportation should eliminate the proposed access road projected across tidal wetlands along the western border of the Airport, connecting Airport property to Thomas Road from its future plans. In addition, the proposed seaplane ramps into the Poquonock River and the proposed industrial area in the vicinity of runway 10-28 should be eliminated from the State's future plans for Trumbull.

TO THE TOWN:

- The Town should adopt an ordinance establishing allowable noise limits within and above the Town's corporate limits and such standards should be strictly enforced. These standards should identify acceptable noise levels and should prohibit the use of a noise generating facility during the late evening hours. In addition, this ordinance should limit any expansion of the current noise impact area adjacent to the Airport as delineated by existing NEF contours.

- The Town should initiate negotiations with the State Department of Transportation to enable the sale or transfer to the Town of property within the Airport boundary north of the existing Route 649, which is not considered essential for Airport operations and which could be potential industrial areas to expand the Town's tax and job base.

SCRPA recommendations, continued

- In the future, the Town of Groton should not locate or expand noise-sensitive activities, such as schools, in areas subject to high noise impact.

- The Town of Groton should re-evaluate its planning proposals for future land uses in areas subject to high noise impact from the Airport and should develop necessary zoning revisions to reduce the likelihood of sensitive activities intruding into high noise impact areas in the future.

- The Region's political leaders should provide active support for improved high speed ground transportation in the Northeast Corridor and for a service stop in Southeastern Connecticut

Planning Commission recommendations, continued

- Town Council should adopt a resolution immediately setting forth the Town's position with regard to the currently proposed future improvements to Trumbull Airport.

- The Town Council and Board of Education should adopt a policy prohibiting the location of new or expansion of existing noise sensitive activities such as schools, public buildings, etc., in areas subject to high noise impact.

- The Town's Plan of Development and Zoning Regulations should discourage and prohibit the construction of noise sensitive activities in areas subject to high noise impact. Areas adjacent to the Airport's boundary and within the 35 NEF contour should be restricted to industrial or open space - recreation activity only. On that land between the 35 NEF and 25 NEF contours development of industrial, open space - recreation and commercial activities should be permitted. Residential development and the construction of public buildings, including schools, should be allowed in these areas only if sound deadening construction standards are utilized. No restrictions should be required for those areas beyond the 25 NEF contour.

- The Town Council and the Region's political leaders should encourage active support for developing improved high speed ground transportation in the Northeast Corridor including a service stop in Southeastern Connecticut.

APPENDICES

SOUTHEASTERN CONNECTICUT
REGIONAL PLANNING AGENCY

139 Boswell Avenue, Norwich, Connecticut, tel. 889-2324

January, 1972

PASSENGER SURVEY, TRUMBULL AIRPORT

This survey is being conducted on January 10, 13, 14, 17, 20, and 21, by the Southeastern Connecticut Regional Planning Agency and the Groton Planning Office in conjunction with a study on the present and potential role of Trumbull Airport. The results of the survey will help determine the area being served by the Airport and the type of service that is desired.

The questionnaire was prepared with the assistance of the Connecticut Department of Transportation and the completed forms will ultimately be returned to them for use in the airport planning program. The results will also be made available to the airline personnel.

To obtain an accurate picture of the persons using Trumbull Airport, a separate questionnaire should be completed by each member within a traveling group.

We appreciate your cooperation in completing this form.

If you are completing this form on board the aircraft, it will be collected by airline personnel before you leave the plane.

APPENDIX 1

FOR OFFICIAL USE ONLY

Trumbull Airport   Date________ Time________ a.m. p.m.   1 [ ][ ][ ][ ][ ][ ]

Inbound________ Outbound________   7 [ ][ ][ ][ ]

Airline________ Flight #________   11 [ ][ ][ ][ ][ ]

Survey to Improve Passenger Service

Conducted by: The Southeastern Connecticut Regional Planning Agency and the Town of Groton

Interviewer________________________

1. Place of Residence________________________   16 [ ][ ][ ][ ][ ][ ]
   (City) (State) (Country)

2. Departure Airport________________________   22 [ ][ ][ ]
   (Name) (Location)

3. Where Did You Start Your Trip To This Departure Airport today?________________________   25 [ ][ ][ ][ ][ ][ ]
   (City) (State) (Country)

   Check (Home__) (Office__) (Hotel__) (Other________)   31 [ ]
   Hosp.,School,etc.

4. Time trip to Departure Airport Started________ a.m. p.m.   32 [ ][ ][ ][ ]
   Approx. travel time to airport________min.   36 [ ][ ][ ]

5. Mode of transportation to Airport (Private Auto__)   39 [ ]
   (Limo.__) (Bus__) (Taxi__) (Train__) Airplane__) (Other__)
   Specify

6. Purpose of trip (Business__) (Pleasure__) (Other__)   40 [ ]
   Specify

7. Destination Airport________________________   41 [ ][ ][ ]
   (Name) (Location)

8. Final Destination________________________   44 [ ][ ][ ][ ][ ][ ]
   (City) (State) (Country)

   Check (Home__) (Office__) (Hotel__) (Other________)   50 [ ]
   Hosp.,School,etc.

9. Mode of Transportation from airport to final destination   51 [ ]
   (Private Auto__) (Limo.__) (Bus__) (Taxi__) (Train__)
   (Plane__) (Other__)
   Specify

10. Non-Stop Flight (Yes__) (No__)   52 [ ]
    If Not, Stops enroute________________________   53 [ ][ ][ ]
    (Airport) (City) (State)

    Change Planes (Yes__) (No__)   56 [ ]

11. Have you ever Flown before (Yes__) (No__)   57 [ ]

    a) If No, Why not________________________   58 [ ]

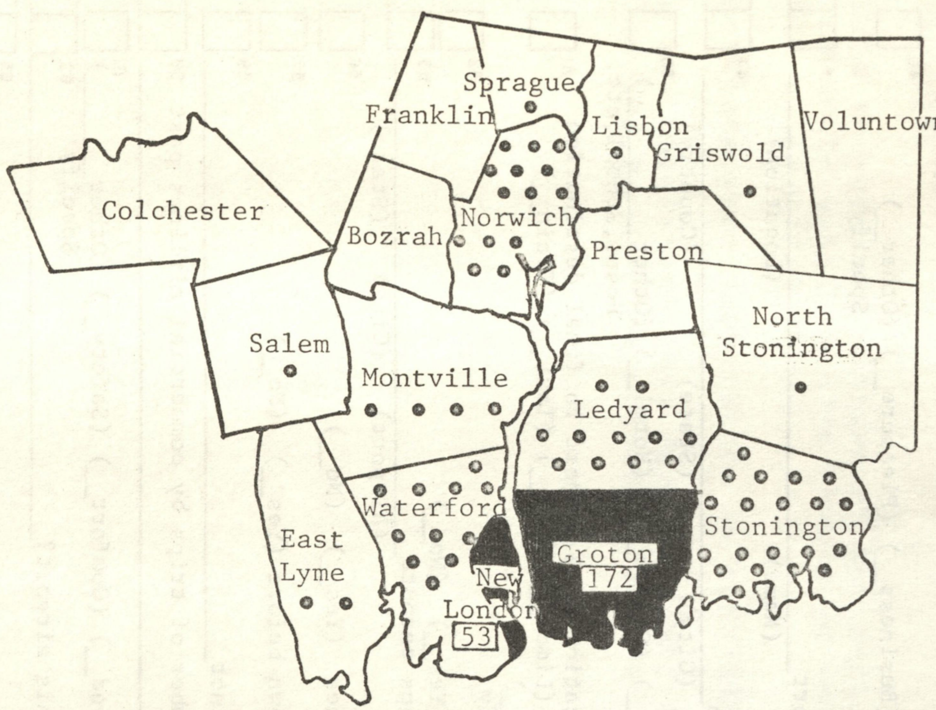
    b) If yes, number of trips by commercial airlines past 12 months________________________   59 [ ][ ]

12. Why by air? (Speed__) (Comfort__) (Safety__) (Other________)   61 [ ]
    Specify

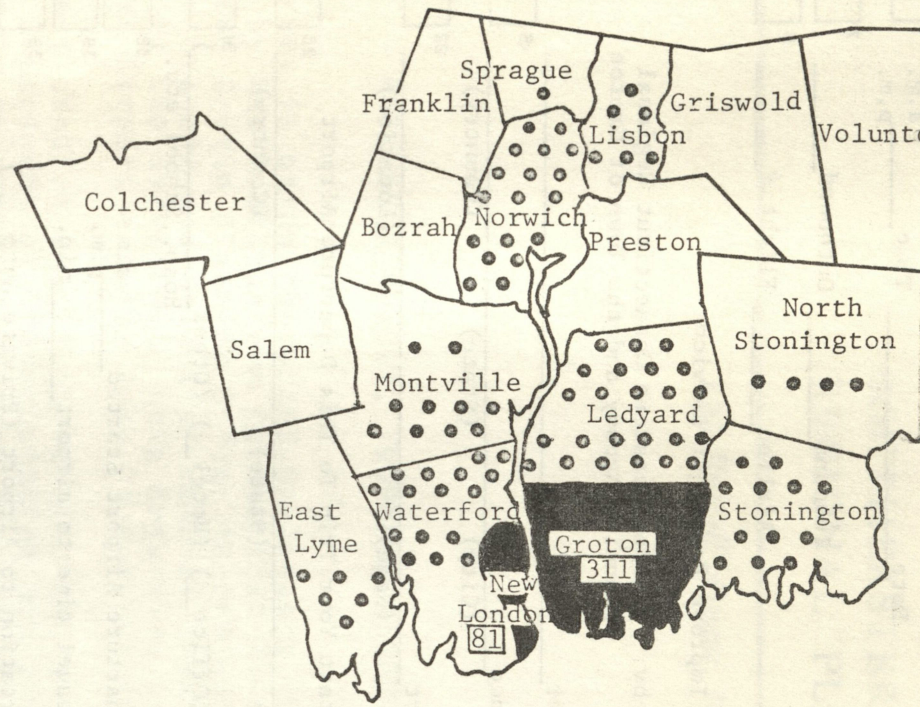
13. Why do you use this airport?________________________   62 [ ][ ][ ]

14. Comments:________________________   65 [ ][ ][ ]

ORIGIN AND DESTINATION SURVEY
TRUMBULL AIRPORT, JANUARY 1972



DESTINATIONS OF INBOUND PASSENGERS



ORIGINS OF OUTBOUND PASSENGERS

NOTE: 1 dot equals 1 passenger; totals are for the six days covered by the O&D Study.

APPENDIX 1

INDUSTRIAL SURVEY
TRUMBULL AIRPORT STUDY

February, 1972

Southeastern Connecticut Regional Planning Agency

Town of Groton Planning Office

FIRM______________________________ DATE______________________

TIME______________________

MR./MRS.____

POSITION____

INTERVIEWED BY____

1) What modes of transportation does your firm make use of?
Auto__________ Truck__________ Rail__________ Air__________ Ship__________

2) Rank, in order of importance to your firm, the following modes of transportation.
Auto__________ Truck__________ Rail__________ Air__________ Ship__________

3) What percent of your total transportation need is met by each of the following at present?
Auto__________ Truck__________ Rail__________ Air__________ Ship

4) a) How important is air transportation to your firm?
Very important__________ Important__________ Of minor importance__________
Not important__________

b) Why?____

____

____

5) Which air service is most important to your firm, passenger______ freight______

6) Which airport does your firm usually make use of?
Trumbull______ Bradley(Hartford)______ Green(Providence)______ New Haven______ Other______

7) Was Trumbull Airport a significant factor in your company moving into the area?
Yes________ No________

8) Can you estimate the number of your personnel who use Trumbull Airport for business purposes each week?______________________________

APPENDIX 2

9) a) Can you estimate the number of other businessmen that use Trumbull Airport to visit your establishment each week? ____________

b) Do you consider this convenience offered by Trumbull Airport vital to your operation? Yes__________ No__________

10) a) Should passenger service at Trumbull Airport be expanded________ eliminated__________ or maintained at the present level________

b) If expanded, what services and/or destinations should be added?

____

____

____

11) a) Should freight service at Trumbull Airport be expanded________ eliminated________ or maintained at present level__________

b) If expanded, what should be done? ____________________________

____

____

____

12) a) In your opinion, what percent of your future (1980) freight traffic will be carried by the following modes of transportation?
Truck______ Rail______ Air______ Ship______ Some new system______

b) What percentage of company related passenger travel (1980)?
Auto______ Bus______ Rail______ Air______ Some new system______

13) a) Could some new form of transportation, for example high speed rail service for the Northeast Corridor (Boston-New York-Washington, D.C.), replace your firms need for air transportation?
Yes______ No______ Possibly______

b) If yes, what level service would such a new system have to provide in terms of cost, time, frequency, and reliability ____________________________

____

____

____

____

APPENDIX 2

14) What affect would the following actions at Trumbull Airport have on your firms operation?

	Very Harmful	Minor Harm	None	Minor Benefit	Major Benefit
a) Passenger service were restricted to serve only Boston, New York, Hartford, New Haven, Providence	______	______	____	______	______
b) Passenger service were discontinued	______	______	____	______	______
c) Freight service were discontinued	______	______	____	______	______
d) Passenger service was expanded to include twice as many flights within the present service area (Boston, Hartford, New York, Phild., Wash. D.C., Newport News)	______	______	____	______	______
e) Flights, either non-stop or one-stop only were offered to such points as Chicago, St. Louis, Memphis and Atlanta	______	______	____	______	______

APPENDIX 2

NOTE: This page may be filled out prior to or after the interview, if desired.

15) As a businessman how would you assess the importance of Trumbull Airport to the Town of Groton and the region;

At the present time? ______________________________

____

In the future? ______________________________

____

16) If your company could provide us with any data or statistics such as a monthly breakdown for your firm's passenger and freight air traffic, it would be greatly appreciated.

APPENDIX 2

NAVAL UNDERWATER SYSTEMS CENTER
NEW LONDON, CONNECTICUT 06320

TRUMBULL AIRPORT AIRCRAFT NOISE SURVEY

By

A. Michael Schindler

Test Report No. 4163

17 April 1972

APPENDIX 3

NAVAL UNDERWATER SYSTEMS CENTER
HEADQUARTERS
NEWPORT, RHODE ISLAND 02840

NEWPORT, R. I. 02840
AREA CODE 401
841 - EXT.
AUTOVON 948 + EXT.

NEW LONDON, CONN, 06320
AREA CODE 203
442 - 0771 - EXT.
AUTOVON 636 + EXT. 2358

IN REPLY REFER TO:
EA31:AMS:hhm
3960
Ser EA31-26

19 APR 1972

Mr. Richard B. Erickson
Executive Director
Southeastern Connecticut Regional Planning Agency
139 Boswell Avenue
Norwich, Connecticut 06360

Dear Mr. Erickson:

Enclosed please find Test Report No. 4163, "Trumbull Airport Aircraft Noise Survey", by A. Michael Schindler, dated 17 April 1972.

The measurements were undertaken at the request of the Southeastern Connecticut Regional Planning Agency.

Sincerely yours,

B. B. Burnham

B. B. BURNHAM
Division Head
By direction of the
Commanding Officer

Encl:
(1) Test Report No. 4163

APPENDIX 3

INTRODUCTION

As part of the "Domestic Action" program, the Center assisted the Southeastern Connecticut Regional Planning Agency (SCRPA) by performing an acoustical survey of aircraft noise in the area surrounding Trumbull Airport, Groton, Conn. Of particular interest were the areas most sensitive to noise such as schools and residential areas.

APPROACH

The approach to measuring the noise levels took into consideration:

a. Instrumentation to be used.
b. Measurement locations.
c. Aircraft to be measured.

The instruments used for the survey were the General Radio type 1565-A and type 1551C sound level meters and a Hewlett Packard 8062A impulse sound level meter. The General Radio 1565-A was principally used due to its compactness and ease of operation. All of the instruments were calibrated and comparison readings indicated differences no greater than 1 dB.

All of the areas chosen for taking measurements were generally in line with or near the flight path of arriving and departing aircraft. Consideration of noise sensitivity or annoyance was also applied in choosing the measurement locations.

In general, it was desirable to take measurements for both arrival and departure of each type aircraft at each location, but this was not always possible due to wind direction, normal airline operating procedures, and time limitation to complete the survey. Most of the measurements were performed on the two types of aircraft operated by Pilgrim Airlines and Allegheny Airlines, the DeHavilland Twin Otter and Convair 580 respectively, since their arrivals and departures were scheduled and predictable. Occasionally, readings from other types of aircraft were taken whenever possible.

RESULTS

The following is a listing of the data taken at each point of interest. Also included are some extraneous readings for comparison. All measurements were in terms of sound pressure level in decibels (dB) ref .0002 μbars using the "A" weighted scale. The "A" scale approximates the frequency response of the human ear and is most generally accepted for aircraft noise measurements. All readings listed were peak levels expressed in dB. The time durations of the peak readings were generally less than three seconds. The measurements were taken during the period of 29 February 1972 to 10 April 1972. The temperature conditions during this period generally ranged between 35° to 55°F.

APPENDIX 3

LOCATION/AIRCRAFT TYPE	LEVEL
1. Jupiter Point - state boat launching area	
Ambient Level	+45 to +50 dBA
a. Allegheny departure	+76 dBA
b. Pilgrim departure	+71 dBA
c. Pilgrim arrival	+70 dBA
2. Jupiter Point (at the end of Pine Island Road)	
Ambient level	+41 dBA
a. Allegheny departure	+78 dBA
b. U. S. Navy Convair 440 departure	+78 dBA
3. Elks Club (Jupiter Point)	
Ambient level	+45 to +50 dBA
Allegheny departure	+69 dBA
4. West Side Junior High School	
Ambient level	+55 dBA
a. Pilgrim departure	+65 dBA
NOTE: Plane banked to the south over the golf course	
b. Piper Cherokee (light plane)	+75 dBA
NOTE: Plane was departing directly overhead	
c. Allegheny departure	+75 dBA
d. Passing automobiles	+75 dBA
5. Colonial Manor (Colonial Drive and Mohawk)	
a. Pilgrim departure	+64 dBA
6. Top of Fort Hill	
Ambient level	+60 to +70 dBA
a. Pilgrim arrival	+65 dBA

APPENDIX 3

LOCATION/AIRCRAFT TYPE(cont.)	LEVEL
7. Fitch Junior High School	
Ambient level	+45 dBA
a. Pilgrim arrival	+70 dBA
NOTE: Plane followed railroad tracks South of the Junior High	
b. Allegheny arrival	+74 dBA
c. Allegheny departure	+84 dBA
d. Trucks passing by	+75 to 80 dBA
e. Cars passing by	+65 to 70 dBA
8. South side of railroad trestle near Fitch Jr. High School (Approximately 1/4 mile from end of runway)	
Ambient level	+45 dBA
a. Allegheny arrival	+91 dBA
NOTE: Plane was directly overhead when measured	
9. Entrance to Beach Road (Approximately 750 ft. from end of runway)	
Ambient level	+45 dBA
a. Allegheny departure	+70 dBA
NOTE: Plane was departing from this end of the runway and was on the ground when measured	
b. Pilgrim arrival	+72 dBA
10. Thomas Road across from Tuthill's Nursery (Approximately 450 ft. from the end of the N.W. runway)	
Ambient level	+45 to 50 dBA
a. Pilgrim arrival	+90 dBA
b. Cessna 150 (light plane)	+65 dBA
c. Helio Courier (light plane)	+85 dBA
NOTE: These aircraft were all measured directly overhead	

APPENDIX 3

CONCLUDING REMARKS

The task of conducting an aircraft noise survey was undertaken by the Center solely for providing technical assistance in the noise measurement technique. No discussion, conclusions, or recommendations are submitted herein.

A. Michael Schindler

A. MICHAEL SCHINDLER
Electronic Engineer

APPENDIX 3

DATE	ISSUED TO
NO 13 '72	BOOK PREP.
[illegible]	Eigena Salati '78

DATE DUE

MAY 19 1976			